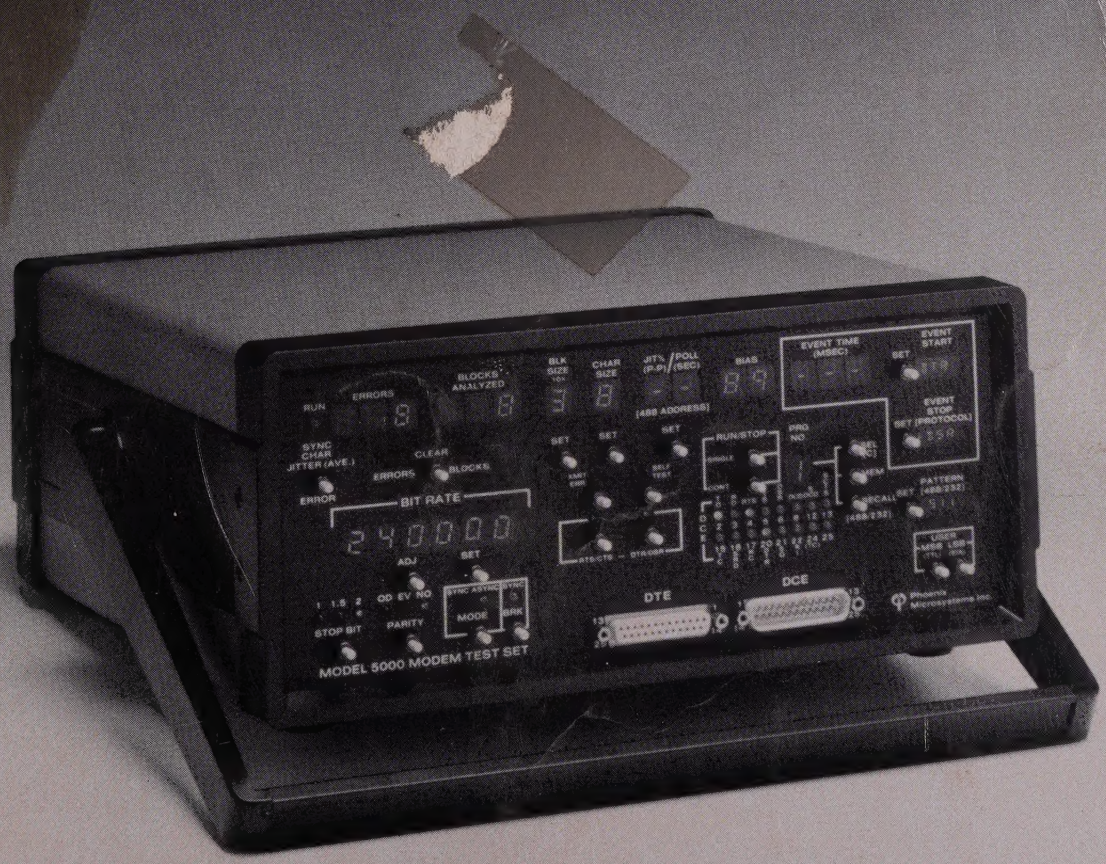
# PHOENIX 5000

## MODEM TEST SET




# OPERATIONS MANUAL

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APPENDIX A

INTRODUCTION

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APPENDIX

APPENDIX

# PHOENIX 5000 USERS MANUAL

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## 1.0 INTRODUCTION

The Model 5000 Modem Test Set is a general purpose intelligent data communications link analyzer. It is capable of thoroughly testing a wide variety of modems and other data communications equipment.

Test features include: variable bit length words, variable block lengths, selectable pseudo-random sequences and patterns, poll testing, variable bit rates, parity options, adjustable stop bit width, event timing on all primary RS-232 functions, digital bias indication, modem and external clock measurement, external clock source, and IEEE 488 or RS-232 remote programming.

Special features include: Ten user defined programs to instantly configure all front-panel controls (internal .ni-cad battery maintains programs in CMOS RAM when power is removed), a real time clock operating as either a stop watch or time of day clock set and read by the controller, front panel selection of TTL or EIA interface levels, audible tone indication at completion of single block test, user selectable bit patterns, and complete DCE signal active indicators.

A triple Z80 micro processor configuration is utilized that provides 95% of test features in software. Therefore many custom requirements can be met simply by changing the software instruction set.

All test patterns utilized are standard to a wide variety of similar test equipment. Simply setting the bit rate, block size, parity, stop bits, sync or async, and pattern lengths will insure synchronization.

For added convenience front and rear panel DCE (Data Communication Equipment) and DTE (Data Terminal Equipment) connectors are provided.

## 2.0 FRONT PANEL CONTROLS

All front panel controls are momentary push buttons that allow the user to single step or scroll through the various options for each switch. This method was selected to allow all features to be programmable by the user or remote programmable from the IEEE 488 or RS232 control ports.

The front panel layout is shown in Figure 1.

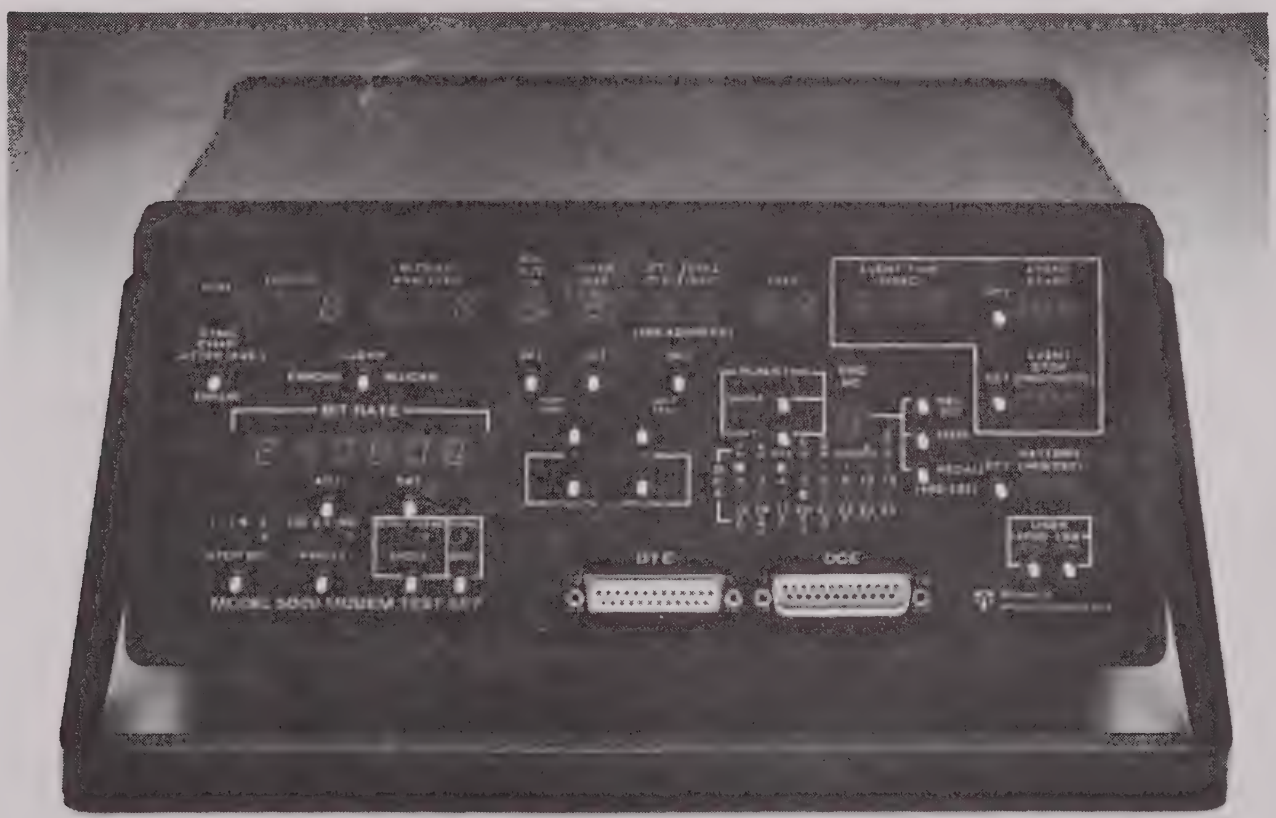



Figure 1

Phoenix Model 5000 Front Panel Layout

## 2.1 Bit Rate

The Bit Rates are selected by the SET switch under the BIT RATE DISPLAY. The bit rate is transmitted out on pin 24 of the DCE connector for sync mode internal clock. Standard bit rates are as follows:

(1) 75 BPS

(2) 110.01 BPS

(3) 134.50 BPS

(4) 150.00 BPS

(5) 300.00 BPS

(6) 600.00 BPS

(7) 1200.00 BPS

(8) 1800.00 BPS

(9) 2000.00 BPS

(10) 2400.00 BPS

(11) 4800.00 BPS

(12) 7200.00 BPS

(13) 9600.00 BPS

(14) 14,400.00 BPS

(15) 16,000.00 BPS

(16) 19,200.00 BPS (18,000 BPS in ASYNC-mode)

(17)----(sync mode only - uses external clock from modem) (DCE pin 15)

Bit rate adjust switch allows the user to vary the bit rate according to the following table (sync mode):

| | | |
|---|---|---|
| (1) | 19,200 | 79.67 BPS increments |
| (2) | 16,000 | 55.34 BPS increments |
| (3) | 14,000 | 44.86 BPS increments |
| (4) | 9,000 | 19.96 BPS increments |
| (5) | 7,200 | 11.27 BPS increments |
| (6) | 4,800 | 4.96 BPS increments |
| (7) | 2,400 | 1.25 BPS increments |
| (8) | 2,000 | .70 BPS increments |
| (9) | 1,200 | .31 BPS increments |
| (10) | 600 | .08 BPS increments |
| (11) | 300 | .019 BPS increments |
| (12) | 150 | .005 BPS increments |
| (13) | 134.5 | .004 BPS increments |
| (14) | 110 | .003 BPS increments |

Depressing the "ADJ" switch increments the bit rate higher (in 217 NS increments). While depressing the "ADJ" switch the bit rate "SET" switch can be depressed to decrement to a lower bit rate.

All bit rate increments listed above are applicable for sync mode operations. In the async mode with word lengths of 5,6,7,or 8 bits,the bit rate increments are 16 times higher. For async infinity, "character size(-)" the bit rate increments are 32 times higher since a phase lock loop recovery circuit is required.

## 2.2 Bit Rate (Modem Clock Generated)

In the synchronous testing mode the Model 5000 can be switched to the modem generated clock. The bit rate set switch is depressed until all dashes (-----) appear on the display momentarily. The test set is now using the modem clock (DCE pin 15) and measures (up to 64KHZ) the modem clock to a resolution of .1 HZ and an accuracy of better than .01%. The test set internal bit rate is disabled from pin 24 of the DCE connector in this mode.

## 2.3 Bit Rate (External Clock Source)

Connect a TTL clock source of the desired bit rate to the BNC connector on the rear panel. The test set automatically switches to, measures, and displays the external clock to a resolution of .1 HZ and an accuracy of better than .01%.

CLOCK REQUIREMENTS

INPUT VOLTAGE Low 0 $\pm$ 0.4 Volts High 5.0 -1.0/+0.5 Volts

FREQUENCY RANGE 50 HZ to 64KHZ

50 HZ to 307.2 KHZ for ASYNC x 16

**NOTE:** Input frequency of the external clock source must be sixteen (16) times the desired bit rate in the asynchronous mode for 5,6, 7, or 8 data bit formatting. The test set internal bit rate is removed from pin 24 of the DCE connector in this mode. In the sync mode or in async continuous (char size-) the bit rate is identical to the external clock input.

## 2.4 Parity

In the async mode (5, 6, 7, and 8 bit character size) parity may be selected as even, odd, or none.

## 2.5 Stop Bit

In the async mode (5, 6, 7, and 8 bit character size) the stop bit may be selected as 1, 1.5, or 2.

## 2.6 Character Size

Character size is selected in the async mode for data bit lengths of 5, 6, 7, or 8. This is independent of start, stop and parity bits. The maximum word length is thirteen (13) bits consisting of 2 start bits, 1 parity bit, eight data bits and 2 stop bits. The minimum word length is seven (7) bits consisting of 1 start bit, 5 data bits and 1 stop bit.

It is possible to run a continuous data stream in the async mode by selecting infinite character size (-). In this mode there is no word formatting. The test set transmits only the data pattern requested by the operator as a continuous bit stream.

## 2.7 Sync/Async Mode

The model 5000 Modem Test Set is capable of synchronous and asynchronous operation.

**Sync Mode** - The test set sends a continuous data stream out on pin 2 of the DCE. Transmit data is clocked out with a clock source. The clock source may be any one of three clocks. The first clock is generated by the test set and displayed as the bit rate and transmitted out on pin 24 of the DCE connector. The second possibility is use of the modem generated clock. The bit rate is set to all dashes (-----) and the test set switches data clocking to pin 15 of the DCE. Pin 24 clock output is turned "off." The third possibility is an external clock source connected to the test set rear panel via a BNC connector. The test set automatically switches to the clock source connected and momentarily displays E-U-C for EXTERNAL USER CLOCK and then displays the measured frequency. External frequencies may be any frequency from 50 HZ to 19.2 KHZ. The clock is transmitted out on pin 24 of the DCE connector.

**Async Mode** - Test set clocks data out at a bit rate selected by the test operator. Data is formatted with start and stop bits, 5, 6, 7, or 8 data bits and optional parity. There is an infinite character mode set by dash (-) in the CHAR SIZE display. In this mode data is transmitted as a continuous stream without start, stop, and parity bits.

The test operator may use the external clock input as a time base for clocking data out by connecting a TTL (0-5 volt) input to the BNC connector on the rear panel.

The input frequency is divided by 16 for data clocking in character sizes 5, 6, 7, 8. The maximum input frequency is 307.2KHZ which means the maximum data rate is 19.2 KBPS. When the character size is set to infinite (-) the input clock frequency and the data rate are identical.

## 2.8 Sync Indicator/Sync Break Switch

The Sync Indicator Light has the following states:

(1) **Solid off -** Indicates that a synchronization pattern not been received that compares to the pattern switch setting, or that 2 seconds have elapsed since the sync pattern was last detected.

(2) **Blinking -** Indicates that a synchronization pattern was received at least once (sync recovered). Blinks if sync was ever lost, even momentarily, and will continue to blink until sync is "set" by either the operator or the controller.

(3) **Solid on -** Indicates that a synchronization pattern is being received every pattern sequence without error. (Depressing the "Sync BRK switch for less than 2 seconds will set the sync indicator to a solid "on" if indicator was previously blinking).

The synchronization patterns used to determine the sync indicator status follows:

| PATTERN | SYNC COMPARE PATTERN |
|---|---|
| 63 | "101111" |
| 511 | "1111011111" |
| 2047 | "11111101111" |
| ALT | "01010101010101" verified every 1000 bits |
| MARK | "1111111111111111" verified every 1000 bits |
| SPACE | "0000000000000000" verified every 1000 bits |
| USER | Sync is detected as the lower 5 bits of the user pattern and is verified every 200 characters (valid only in async 5, 6, 7, or 8 bit words). |
| PL1-PL5 | See Poll Pattern Section 2.23 |

If data stops for approximately 1-2 seconds in any pattern the sync indicator will be set off. If the proper pattern then continues the indicator will blink. The "SYNC BRK" switch has two functions. Momentarily (less than 2 seconds) depressing the switch will force the sync indicator to a solid "on" if the synchronization pattern is being received properly. Depressing the switch for 2-3 seconds will force synchronization to be broken. When the switch is released the sync indicator will then blink indicating synchronization has been lost and recovered.

**2.9 Block Size -**

The block size is a measure of the number of bits, words or polls made during the test. The block size may be any number from 1 bit per block to $10^8$ bits per block depending on mode of operation. When the block size is changed from a high number to a low number press the reset switch to begin immediate testing at the smaller block size.

**Sync or Async infinity** - The number of bits tested relate directly to the exponent of ten displayed.

EXAMPLE: BLK SIZE = 3

Bits per block = $10^3$ =1000

**Async Fixed Word** - For async testing with word lengths of 5, 6, 7, or 8 data bits the exponent is for words analyzed.

EXAMPLE: BLK SIZE =2

Words analyzed per block = $10^2$ = 100

This block counting method applies to all poll conditions.

**NOTE:** For data rates of 14,000 BPS and above use block sizes greater than 1.

## 2.10 Blocks Analyzed Display

The blocks analyzed display, indicates the number of blocks received by the receive processor. This display directly reflects the number of blocks or the number of poll patterns received.

When the blocks analyzed display exceeds 999, the display is blinked to inform the user of an overrange condition. All displayed digits are valid.

Units with revision 3.60 and above measure block errors and display the data in the BLOCKS ANALYZED DISPLAY when the **CHAR ERROR** switch is pressed.

## 2.11 Error Display

All errors that occur in the receive data stream are logged on the error display in real time. Several error display modes exist depending on the test that is being operated. If the number of errors exceeds 999 at any time the display blinks to indicate an overrange condition. The significant displayed digits are correct during period of overange. By use of an external controller any number of errors can be logged.

**Sync** - bit errors are received and displayed.

**Async Infinity** - bit errors are received and displayed.

**Async 5, 6, 7, and 8 bits** - bit errors are received and displayed.

**POLL PATTERNS**- Poll testing can be performed in both the sync and async modes.

**Sync mode** - The test set displays the total errors in real time. Errors can be both sync errors and message errors. A sync error is displayed each time the test set does not recognize the leading sync characters after DCD is true on the modem. A single message error is displayed each time one or more bits in the text is in error. This means that the maximum number of errors displayed per poll is two regardless of the number of bit errors. The number of sync errors can be obtained as the difference between the total errors and the sync errors by depressing the **CHAR ERROR** switch.

**Async Poll** - The test set continuously monitors the modem output for start bits regardless of the state of DCD. During periods of DCD false the transmit data output is clamped to a mark condition. Any transition of the modem is recognized as an error.

When DCD goes true the test set performs an analysis of receiver input data. Any incorrect bits are displayed as errors. This means that errors displayed per poll are the sum of the total errors made by the unit under test.

## 2.12 Char Error

Depressing the CHAR ERROR switch yields several atlernate test results for several different functions.

**Sync mode** - Errors are displayed as bytes.

**Async mode (5, 6, 7, and 8 data bits)** the number of words which contained one or more errors.

**Sync POLL TEST** - Displays the number of times DCD on the modem went true and the test set did not recognize the sync characters on leading edge of the poll transmission. Maximum number of sync errors per poll is one.

**Async Poll Test** - Depressing the CHAR ERROR switch changes the display to indicate the number of words in error as determined with the CHAR SIZE set in.

**JITTER** - On units fitted with jitter measurement option the test set displays the average jitter in 1024 edge samples. This display is updated each time a sample block is analyzed. The average jitter is calculated as the sum of the absolute values of edge transitions from ideal divided by the number of samples. Jitter is displayed on the Poll DLY LEDS.

**BLOCK ERRORS** - Units with revision numbers of 3.60 and above are capable of measuring block errors. To obtain the test results during or at the completion of a test press the **CHAR ERROR** switch and observe the data in the BLOCKS analyzed window.

## 2.13 Block and Error Reset Switch

The block and error reset switch resets the block and error count to zero. The operator should actuate the switch any time the block size is changed to insure immediate counting of the desired block size.

## 2.14 RTS/CTS

When the RTS/CTS switch is depressed and the indicator above the switch is illuminated, Request To Send (RTS) is set "True" on pin 4 of the DCE connector and pin 5 of the DTE connector. The RTS/CTS switch controls the transmit data function also. When RTS is "True" the test set sends out the data stream called for by the front panel settings. Changing RTS to "False" causes the transmitter to be held in a continuous MARK condition for EIA outputs.

RTS is controlled by the test set microprocessor and the operator specified Poll delay time during poll testing. The front panel switch is inactive.

## 2.15 DTR/DSR Switch

When the DTR/DSR switch is depressed and the indicator above the switch is illuminated, DTR is set "True" on pin 20 of the DCE interface. Pin 6 of the DTE interface is also set "True".

## 2.16 XMIT ERR Switch

The XMIT ERR switch injects one error per pattern when activated for any of the three pseudo random patterns of 63, 511, and 2047. The flashing LED above the switch alerts the operator to the active status.

Poll errors may be injected in any of the poll messages. The error insertion in all poll messages is made as the least significant bit of the last character of the message.

## 2.17 Self Test

The Model 5000 Modem Test Set can be self tested by depressing the self test switch . This causes receive data to tied to transmit data independent of the "outside world" connections. Testing can be performed on all patterns (Except Poll Patterns) while displaying blocks analyzed and error data. Further verification of error recognition can be made by activating the XMIT ERR switch while transmitting any one of the three pseudo-random patterns of 63, 511, or 2047.

## 2.18 Bias Indicator

The BIAS indicator displays the ratio of "MARK" to "SPACE" pulse width. All spaces are a 0 indication while all marks are a 99 indication. Normal readouts (In an pseudo random pattern or ALT) should be between 48 and 52. The measurement is made at the receiver as the average over one second and is updated at a one second rate.

## 2.19 Single or Continuous Block Testing

To display errors and blocks analyzed testing must be initiated via the "single" or "cont" test switches. The "single" switch performs one block of testing at the completion of which an audible tone is sounded. The "cont" switch allows continuous testing while error and block numbers are displayed and updated in real time.

## 2.20 Event Timing

The test set can perform event timing on any of the primary RS232 signals. The event time must always occur on a change of state for both the event start and event stop functions. If either function does not change state then the event time cannot be read. Event times are displayed in milliseconds with a resolution of 100 microseconds for readings less than 100 milliseconds. The maximum displayed time is 999 milliseconds. Events of longer duration are displayed as OF (overflow). The event start and event stop may be set to either the rising edge (+) or the the falling edge (-) of any of the signals. The event time is continuously updated in one second intervals. If the event being read is a single event, the reading is held on the display.

Event start and stop may be any combination of the following signals.

| | |
|---|---|
| +RTS (Rising Edge) | +DTR |
| -RTS (Falling Edge) | -DTR |
| +CTS | +SQ |
| -CTS | -SQ |
| +DSR | +RI |
| -DSR | -RI |
| +DCD | +TD |
| -DCD | -TD |
| +TC | +RD |
| -TC | -RD |
| +RC | |
| -RC | |

**NOTE:** For event times longer than one second refer to REAL TIME CLOCK.

## 2.21 DCE Status Monitors

The status of the DCE output and input lines can be quickly verified by looking at the LED array in the lower center right portion of the front panel. An active line is defined as positive 2.5 volts or greater for EIA signal levels. TTL active level is defined as zero volts. The test set turns the LED "on" for an active line. Two seperate methods exist for determining if a line is active. Lines that normally change state such as TD, RD, RC, TC, and (TC) require edge transitions to keep the LED monitor "on". Transmit patterns of mark and space will not indicate active status. The balance of the monitored lines are steady state levels and are read high "on" and low "off" for EIA output levels. TTL mode steady state levels are high "off" and zero "on".

## 2.22 Storing and Recalling Programs

One of the unique features of the Model 5000 Modem Test Set is the versatile programming feature.

This allows the user to set up any test configuration possible on the front panel regardless of complexity and store the set-up for later recall. The programs are stored in CMOS RAM with a NI-CAD battery back-up, producing a virtually permanent memory. During periods of operation the NI-CAD is trickle charged to maintain peak battery capacity. Memory retention during "off" periods should be several months. If program storage has been lost refer to the maintenance section for battery replacement. There are ten programs available to the user numbered 0 through 9 and selected via the SEL switch. To store a program set the front panel to the desired configuration for performing the test. Select one of the storage locations (0-9) and press the MEM switch. The front panel set-up is now stored. To recall any program select the program (0-9) and press RECALL and the test set is now configured and awaiting the operator command for either a single block test or continuous testing.

## 2.23 Pattern Switch

The model 5000 generates a variety of test patterns for both continuous testing and poll testing.

Patterns for continuous testing include:

1. **2047** pseudo-random pattern 2047 bits in length
2. **511** pseudo-random pattern 511 bits in length
3. **63** pseudo-random pattern 63 bits in length

   The psuedo-random patterns represent the industry recognized standards for minimun feedback requirements to generate a serial data stream one bit less than the binary number. In addition the pattern generation is compatible with equipment from other major test equipment manufacturers. This means that the Model 5000 will transmit to and receive from most existing test equipment.
4. **ALT** - Alternate marks and spaces are generated with an equal mark to space ratio.
5. **MARK** - Test set transmits a constant mark
6. **SP** - Test set transmits a constant space
7. **U-"X","$X_2$"** Test set generates a user defined pattern selected with the MSB switch for "X", and LSB for "$X_2$". "X" is any hex number from 0 through F. The test set sends out a data pattern defined by the hex number.

The sync mode data pattern is eight bits long and then repeats. In the async infinity mode the data pattern is repeated every eight bits. For character sizes of 5, 6, and 7 data bits the pattern consists of the least significant bits and is repeated identically for every word sent by the test set transmitter.

Custom user patterns may be down loaded from the controller via 488/232 control ports. The pattern length may be up to 100 characters and may be loaded as any combination and mix of hex and ASCII characters.

**PING-PONG** - This poll test is an exercise of two modems and two modem test sets operating over a two wire system. Operation consists of a master station (PING) sending out a message to the slavestation (PONG) and the slave station responding to the master. The master station has RTS false for the delay period set by the operator. When the delay expires RTS is driven true. The modem then drives CTS true and the transmitter sends the poll message. The master station poll message is bisync EBCDIC code consisting of:

**PING**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HEX | 32 | 32 | 32 | 37 | FF | FF | FF | FF | FF | 32 | 32 | 32 | 32 | 60 | 60 | C1 | C1 | 2D | FF |
| ALPHA | SY | SY | SY | ET | | | | | | SY | SY | SY | SY | - | - | A | A | EQ | |

At the end of the message the master transmitter is clamped to a MARK condition and RTS is driven FALSE.

The slave station (PONG) begins data analysis as soon as DCD is driven TRUE by the modem. At the end of the message the modem drives DCD FALSE and the test set begins the POLL DLY set in by the operator. When the POLL DLY (minimum 100 microseconds-maximum 990 milliseconds) expires RTS is driven TRUE by the test

set.

The modem responds with CTS TRUE which keys the transmitter for transmission. The slave station message is:

**PONG**

```
 HEX  32 32 32 02 27 F5 C3 5C 5C 5C E3 C5 E2 E3 C9 D5 C7 5C 5C 5C 03 75 A4 FF
ALPHA SY SY SY SX ES 5  C  *  *  *  T  E  S  T  I  N  G  *  *  *  EX    U
```

At the end of the message the test set drives RTS FALSE and waits the next transmission. Error analysis is performed independently on both test sets in the following manner. The test set begins data analysis on the first data bit after the modem drives DCD TRUE. Errors are logged as either SYNC errors or message errors. The test set performs a bit by bit comparison on the sync characters. Any variance is logged as a sync error. If the test set detects sync errors then the message portion of the transmission is ignored. If the sync characters are recognized as being proper then the test set performs a bit by bit comparison of the message portion of the transmission. The maximum number of errors logged per poll is one regardless of the number of bits in error during the transmission.

8. **PL1** - The test set enters the polling mode. RTS is controlled by the test set and is automatically dropped for the period set in POLLY DLY (10-990 msec). After the delay RTS is driven TRUE and the transmitter waits on CTS to be driven TRUE by the modem before sending the poll message. The poll message is the EIA recommended "sync sync EOT." The test set begins data analysis on the first bit after DCD is driven TRUE by the modem. Error analysis consists of two parts, sync errors and message errors.

The test set does a bit by bit comparison to find the sync words. Transitions on the data line between DCD TRUE and recognition of the first SYNC character are ignored. Any bit error in the SYNC characters results in no detection of sync. The test set will log one error if SYNC is not detected, then the message portion of the transmission is ignored and no message errors are logged. IF the SYNC characters are detected properly then the test set does a bit by bit comparison of the message data. Detection of one or more errors in the message will cause the error display to be incremented by one. Only one error will be registered regardless of the number of errors made during the message. The maximum number of errors registered per poll is one.

**PL2** - This poll condition operates in the same manner as PL1. The only difference is the poll message.
The transmission for this poll is the "FOX" pattern or THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK. The sync characters are "T" and "H".

**PL3, PL4,** and **PL5**-- These poll conditions are provided for the customer to write different unique poll messages. The maximum message length is 100 characters. These poll messages can be downloaded via the RS-232 programming port or the IEEE 488 interface. Operational details are given in Appendix A.

## 2.24 Modem Clock Frequency Measurement

The Model 5000 will measure the receive clock (pin 15 DCE) frequency any time the test set is set for external clock. Set the MODE switch to the SYNC position. Depress the SET switch under the BIT RATE display until the test set displays all dashes(------) momentarily. The test set will then display the measured frequency and blink the display to alert the operator of a measured value. The frequency is measured to a resolution of 0.1 HZ and an accuracy of better than .01%.

## 2.25 Frequency Counter

The Model 5000 can be employed as a frequency counter. It is necessary to interrupt all modem testing if the frequency to be measured is different from the modem bit rate. Set the MODE for SYNC testing. Connect a TTL level signal to be measured to the rear panel BNC connector. The test set automatically switches to the external clock source and momentarily displays E-U-C for EXTERNAL USER CLOCK.

The test set then displays the frequency of the external source with a resolution of .1 HZ and an accuracy of better than .01%. The display is blinked to alert the operator that an external clock is being measured.

FREQUENCY RANGE 50 HZ - 64 KHZ

## 3.0 Rear Panel Controls

Only two rear panel controls are provided. The primary power switch is on the right hand side of the panel as viewed from the rear. The optional BUSY switch is located in the middle right side of the panel. The BUSY switch provides three seperate conditions to pin 25 of the DCE. The switch can select +5 volts, open and -5 volts with an output impedance of 300 ohms.

See FIGURE 3.1 for typical rear panel layout.

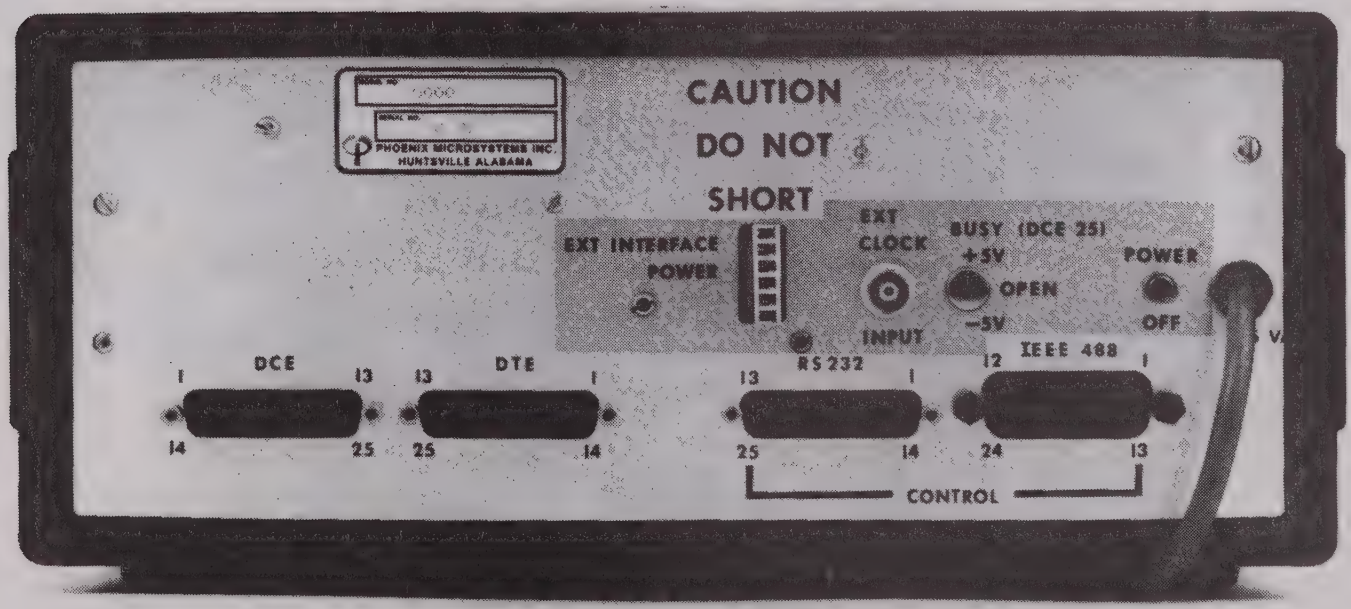



Figure 3.1

Rear Panel Controls of Model 5000

## 4.0 Rear Panel Connectors and Interface Description

The rear panel is fitted with all of the primary connectors for modem and controller interface.

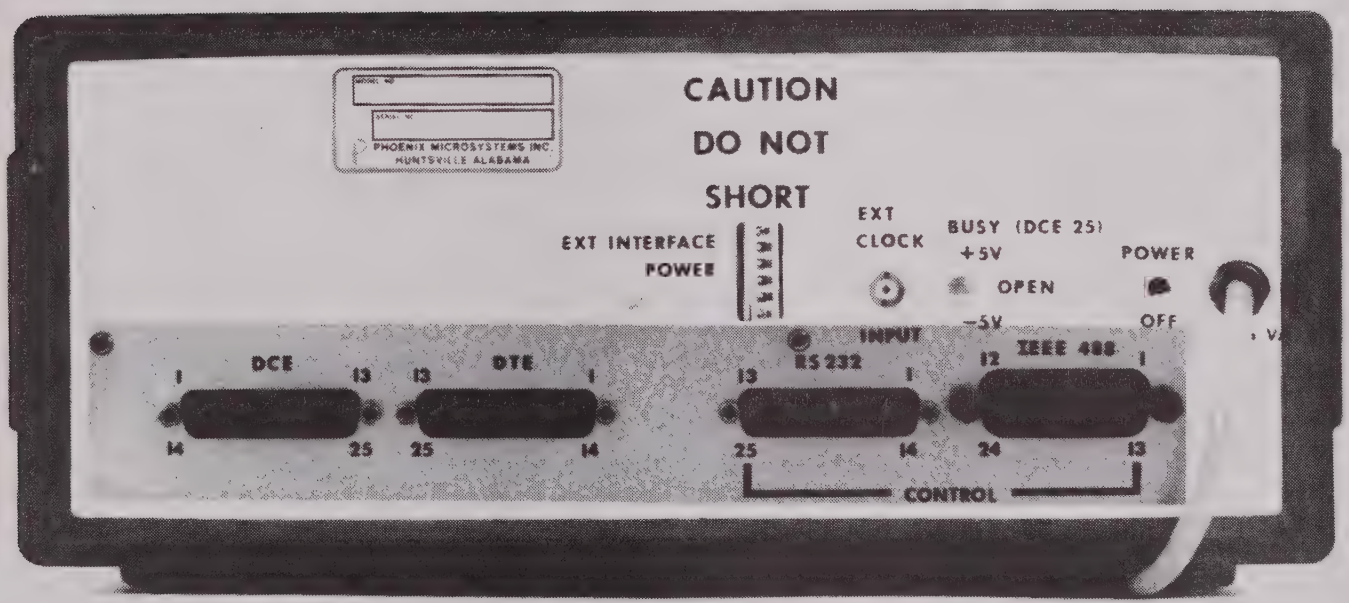



Figure 4.0

Phoenix Model 5000 Rear Panel Layout

## 4.1 Modem Connector (DCE)

This connector provides the interface to the modem under test.

CONNECTOR ON PANEL MALE 25 PIN D SUBMINIATURE

CONNECTOR MATE FEMALE 25 PIN D SUBMINIATURE

SOURCES AMP 206770-1

BELDEN 9DSJ-025

WINCHESTER 49-1125S

T&B ANSLEY 609-25S

| DCE CONNECTOR | NAME | FUNCTION | SIGNAL SOURCE |
|---|---|---|---|
| PIN 1 | FG | CHASSIS GROUND | |
| PIN 2 | TD | TRANSMIT DATA | TEST SET |
| PIN 3 | RD | RECEIVE DATA | MODEM |
| PIN 4 | RTS | REQUEST TO SEND | TEST SET |
| PIN 5 | CTS | CLEAR TO SEND | MODEM |
| PIN 6 | DSR | DATA SET READY | MODEM |
| PIN 7 | SG | SIGNAL GROUND | |
| PIN 8 | DCD | DATA CARRIER DETECT | MODEM |
| PIN 9 | | POSITIVE DC TEST VOLTAGE | MODEM |
| PIN 10 | | NEGATIVE DC TEST VOLTAGE | MODEM |
| PIN 11 | | UNASSIGNED | |
| PIN 12 | (S) DCD | SECONDARY DATA CARRIER DETECT | MODEM |
| PIN 13 | (S) CTS | SECONDARY CLEAR TO SEND | MODEM |
| PIN 14 | (S) TD | SECONDARY TRANSMIT DATA | TEST SET |
| PIN 15 | TC | TRANSMIT CLOCK | MODEM |
| PIN 16 | (S) RD | SECONDARY RECEIVE DATA | MODEM |
| PIN 17 | RC | RECEIVER CLOCK | MODEM |
| PIN 18 | | RECEIVER DIBIT CLOCK | TEST SET |

| | | | |
|---|---|---|---|
| PIN 19 | (S) RTS | SECONDARY REQUEST TO SEND | TEST SET |
| PIN 20 | DTR | DATA TERMINAL READY | TEST SET |
| PIN 21 | SQ | SIGNAL QUALITY DETECT | MODEM |
| PIN 22 | RI | RING INDICATOR | MODEM |
| PIN 23 | | DATA RATE SELECT | |
| PIN 24 | (TC) | EXTERNAL TRANSMIT CLOCK | TEST SET |
| PIN 25 | | BUSY | TEST SET |

Signal Polarity

Positive voltage is binary zero, space and "on" or TRUE.

Negative voltage is binary one, mark and "off" or FALSE.

Signal Levels

Input--Test set requires +2.5 volts or greater for operation on all modem generated signals.

Output--Test set generates all outputs as -5 volts to +5 volts in EIA and zero to +5 volts for TTL.

Impedance Levels

INPUT--TEST set provides a 3000 ohm minimum to 7000 ohm maximum load to all modem generated signals. Typical impedance is 4500 ohms.

OUTPUT--TEST set output impedance is 300 ohms minimum to 500 ohms maximum on all test set generated functions. Typical value is 430 ohms.

## 4.2 Data Terminal (DTE)

This connector provides an interface to emulate a modem for driving async terminal equipment.

CONNECTOR ON PANEL FEMALE 25 PIN D SUBMINIATURE

CONNECTOR MATE MALE 25 PIN D SUBMINIATURE

SOURCES

| | |
|---|---|
| AMP | 206771-1 |
| BELDEN | 9DPJ-025 |
| WINCHESTER | 49-1125P |
| T&B ANSLEY | 609-25P |

| DCE CONNECTOR | NAME | FUNCTION | SOURCE |
|---|---|---|---|
| PIN 1 | FG | CHASSIS GROUND | |
| PIN 2 | TD | TRANSMIT DATE | TERMINAL EQUIP. |
| PIN 3 | RD | RECIEVE DATA | TEST SET |
| PIN 4 | RTS | REQUEST TO SEND | TERMINAL EQUIP. |
| PIN 5 | CTS | CLEAR TO SEND | TEST SET |
| PIN 6 | DSR | DATA SET READY | TEST SET |
| PIN 7 | SG | SIGNAL GROUND | |
| PIN 8 | DCD | DATA CARRIER DETECT | TEST SET |
| PIN 9 | | UNUSED | |
| PIN 10 | | UNUSED | |
| PIN 11 | | UNUSED | |
| PIN 12 | (S) DCD | SECONDARY DATA CARRIER DETECT | UNUSED |
| PIN 13 | (S CTS | SECONDARY CLEAR TO SEND | UNUSED |
| PIN 14 | (S) TD | SECONDARY TRANSMIT DATA | UNUSED |
| PIN 15 | TC | TRANSMIT CLOCK | UNUSED |
| PIN 16 | THRU PIN 19 | | UNUSED |

| | | | |
|---|---|---|---|
| PIN 20 | DTR | DATA TERMINAL READY | TERMINAL EQUIP. |
| PIN 21 | THRU PIN 25 | | UNUSED |

Signal Polarity

Positive voltage is binary zero, space or "ON" or "TRUE".

Negative voltage is binary one, mark and "OFF" or FALSE".

SIGNAL LEVELS

INPUT--TEST set requires +2.5 volts or greater for operation on all terminal equipment generated signals.

OUTPUT--TEST set generates all outputs as -5 volts and +5 volts in EIA mode and zero and +5 volts in TTL.

IMPEDANCE LEVEL

INPUT--TEST set provides a 3000 ohms minimum to 7000 ohm maximum load to all terminal signals. Typical impedance is 4500 ohms.

OUTPUT--TEST set output impedance is 300 ohms minimum to 500 ohms maximum on all test set generated signals. Typical value is 430 ohms.

## 4.3 RS-232 REMOTE CONTROL PORT

This connector is the interface to allow the operator to control the test set remotely with either a modem or an ASCII terminal.

**NOTE:** The primary interface configuration is for modem operation. To drive the test set from a terminal it is necessary to reverse leads on pins 2 and 3 between the terminal and test set.

| | | |
|---|---|---|
| CONNECTOR ON PANEL | FEMALE | 25 PIN "D" SUBMINIATURE |
| CONNECTOR MATE | MALE | 25 PIN "D" SUBMINIATURE |
| SOURCE | AMP | 20677101 |
| | BELDEN | 9DPJ-025 |
| | WINCHESTER | 49-1125P |
| | T&B ANSLEY | 609-25P |

| CONNECTOR | | FUNCTION | SOURCE |
|---|---|---|---|
| PIN 1 | | CHASSIS GROUND | |
| PIN 2 | TD | TRANSMIT DATA | TEST SET |
| PIN 3 | RD | RECEIVE DATA | MODEM OR TERMINAL |
| PIN 4 | RTS | REQUEST TO SEND | TEST SET |
| PIN 5 | CTS | CLEAR TO SEND | MODEM OR TERMINAL |
| PIN 6 | DSR | DATA SET READY | MODEM OR TERMINAL |
| PIN 7 | SG | SIGNAL GROUND | |
| PIN 8 THRU PIN 19 | | UNUSED | |
| PIN 20 | DTR | DATA TERMINTAL READY | TEST SET |
| PIN 21 THRU PIN 25 | | UNUSED | |

SIGNAL LEVELS

INPUT-Test set requires an input level of zero to +5 volts on all signals supplied by the modem or terminal.

OUTPUT-Test set generates +8 volts to -8 volts minimum output levels on all outputs.

SIGNAL POLARITY

+8 volts is binary zero, space "on" or TRUE.

-8 volts is binary one, mark "off" or FALSE.

OUTPUT IMPEDANCE-All test set output lines have less than 500 ohms output impedance.

INPUT IMPEDANCE- The test set input lines (CTS, RD, etc.) have greater than 3000 ohms input impedance.

## 4.4 IEEE-488 Remote Control Port

This connector is the interface to allow the operator to control the test set remotely over a data bus.

Connector on Panel FEMALE 24 Pin Ribbon Type

Connector Mate MALE 24 Pin Ribbon Type

| | | |
|---|---|---|
| SOURCE | 3M | 3548-1000 |
| | AMPHENOL | 840-57F-20240-2 |
| | T&B ANSLEY | 609-24M |
| | MOUNTING SCREWS | 150 M3.9 x 0.6 |

| CONNECTOR | FUNCTION |
|---|---|
| PIN 1 | DIO1 |
| PIN 2 | DIO2 |
| PIN 3 | DIO3 |
| PIN 4 | DIO4 |
| PIN 5 | EOI |
| PIN 6 | DAV |
| PIN 7 | NRFD |
| PIN 8 | NDAC |
| PIN 9 | IFC |
| PIN 10 | SRQ |
| PIN 11 | ATN |
| PIN 12 | SHIELD |
| PIN 13 | DIO5 |
| PIN 14 | DO06 |
| PIN 15 | DIO7 |

| | |
|---|---|
| PIN 16 | DIO8 |

| CONNECTOR | FUNCTION |
|---|---|
| PIN 17 | REN |
| PIN 18 | SIGNAL GRD PAIRED WITH 6 |
| PIN 19 | SIGNAL GRD PAIRED WITH 7 |
| PIN 20 | SIGNAL GRD PAIRED WITH 8 |
| PIN 21 | SIGNAL GRD PAIRED WITH 9 |
| PIN 22 | SIGNAL GRD PAIRED WITH 10 |
| PIN 23 | SIGNAL GRD PAIRED WITH 11 |
| PIN 24 | SIGNAL GROUND |

SIGNAL LEVELS

$\geq$ + 2.0 VOLTS IS BINARY ZERO OR FALSE

$\leq$ 0.8 VOLTS IS BINARY ONE OR TRUE

## 5.0 Specifications

5.1 Bit Rate - 75 BPS to 19.2 KBPS

5.2 Frequency Measurement- 50 HZ TO 64 KHZ

ACCURACY .01%

RESOLUTION .1 HZ

5.3 Stop Bit- 1.0, 1.5, 2.0

5.4 Parity- Even, Odd, None

5.5 Character Size- 5,6,7,8 or continuous

5.6 Operating Mode- Sync or Async

5.7 Poll Delay- 10 Milliseconds to 990 Milliseconds

5.8 Bias- 0 to 99% Resolution 1 count

5.9 Pattern- 63, 511 and 2047 pseudo-random, constant mark, constant space, alternating, Fox, ping-pong poll, loopback poll and four wire poll, user entered poll messages.

5.10 Program Storage- 10 user defined programs stored in CMOS RAM with NI-CAD battery backup.

5.11 Real Time Clock- Stop watch or time of day

RESOLUTION .1 SECONDS

ACCURACY .01 %

5.12 Output Levels- EIA minimum of +5 volts and -5 volts.

5.13 Output Impedance- All output signal source impedances are 300 ohms mininmum to 500 ohms maximum.

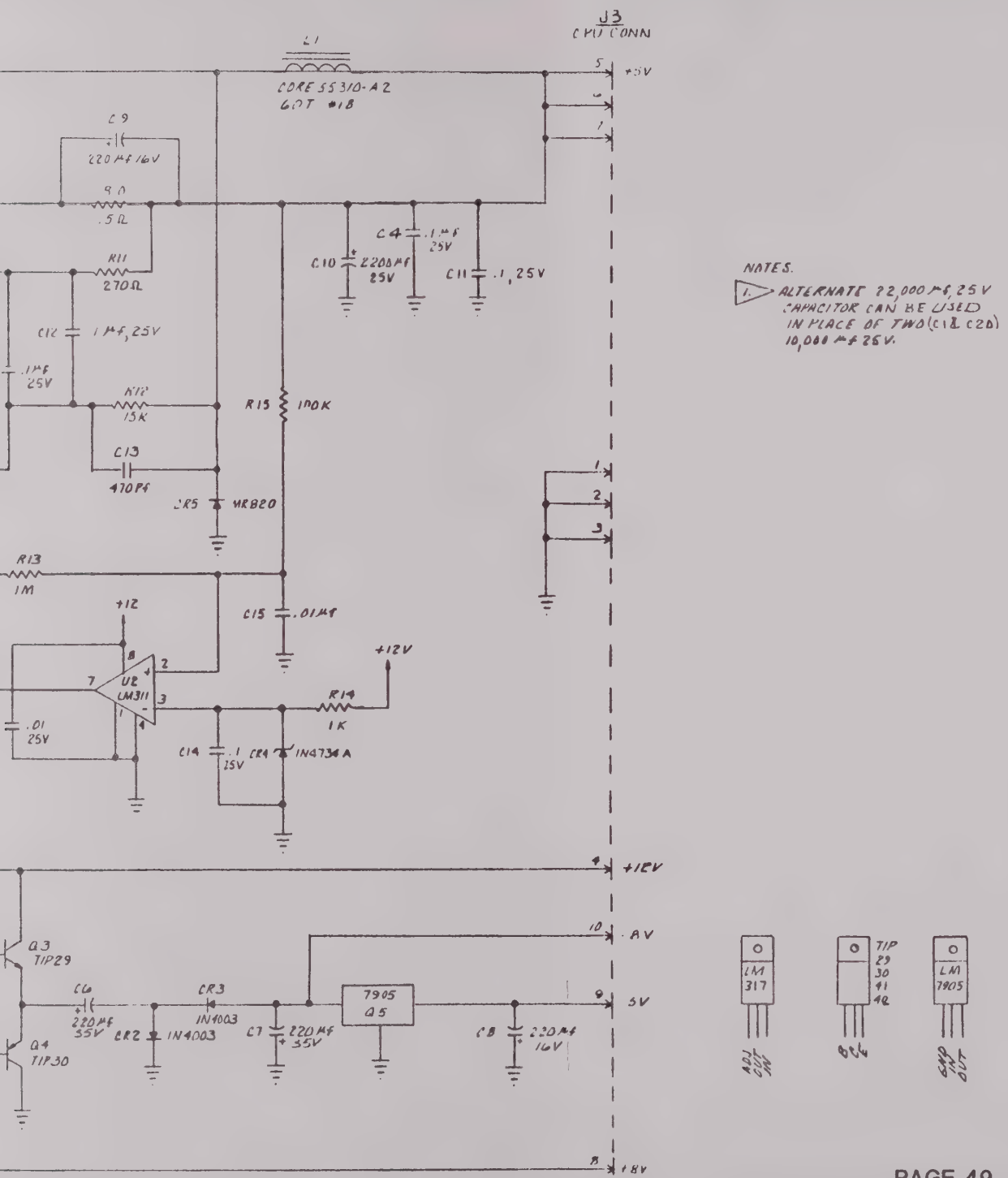
5.14 Input Impedance- All input signal impedances are 3000 ohms minimum to 7000 ohms maximum. Typical value is 4500 ohms.

5.15 Input Power- 110 volts AC, 50 - 60 HZ

5.16 Weight- 8 lbs

5.17 Size- 6" x 12" x 12"

# 6.0 SCHEMATICS






| | |
|---|---|
| 5000-043 | MODEM |
| NEXT ASSY | USED ON |
| APPLICATION | |

CONTRACT NO.

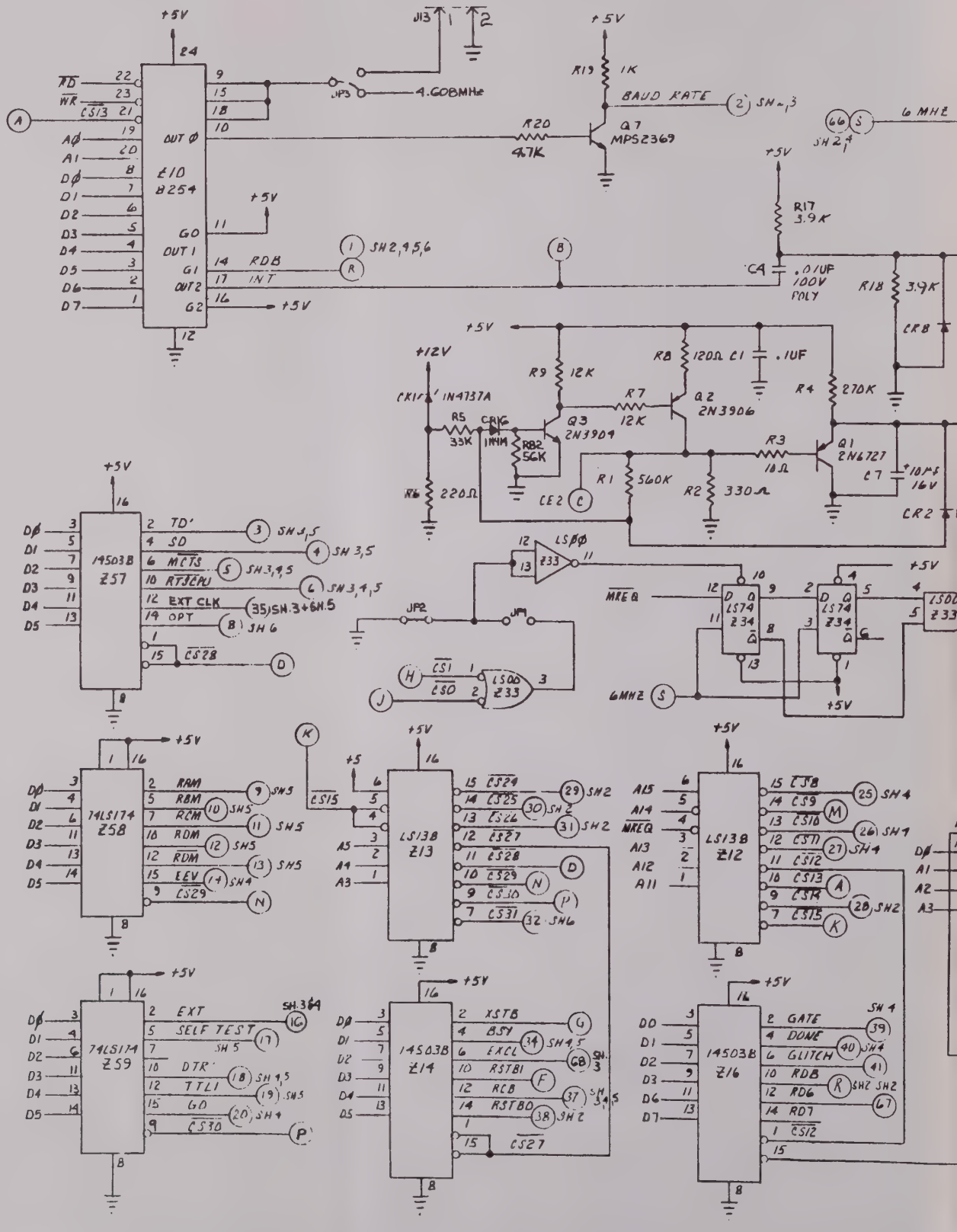
| APPROVALS | DATE |
|---|---|
| DRAWN K. STEPHENS | 11-30-82 |
| CHECKED | |

**PHOENIX MICROSYSTEMS**
HUNTSVILLE, ALABAMA

TITLE
SCHEMATIC
POWER SUPPLY
5000 MODEM

| SIZE | SCM NO | DWG NO | REV. |
|---|---|---|---|
| C | | 5000-042 | G |

SCALE — SHEET OF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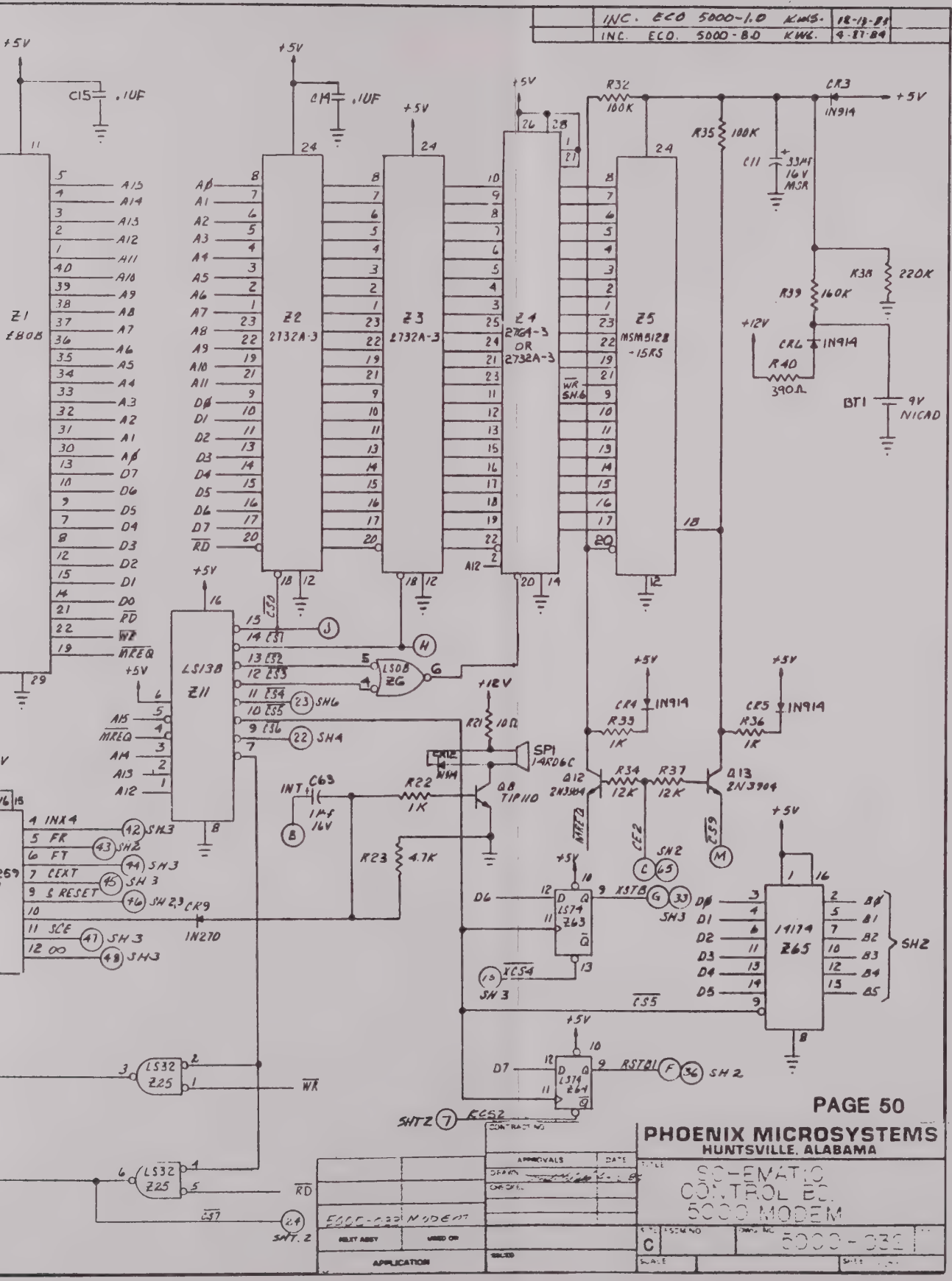
4.608MHz
BAUD RATE
Q7 MPS2369
R20 4.7K
R19 1K
R17 3.9K
R18 3.9K
C4 .01UF 100V POLY
6 MHZ
Z10 8254
OUT 0
OUT 1
OUT 2
RDB
INT
Q2 2N3906
Q3 2N3904
Q1 2N6727
R8 120Ω
C1 .1UF
R9 12K
R7 12K
R4 270K
R5 33K
R6 220Ω
R1 560K
R2 330Ω
R3 10Ω
C7 *10MF 16V
CR1 IN4737A
CR2
CR8
CR9 1N4148
RB2 5GK
CE2
+12V
LSØØ Z33
LSØØ Z34
LSØ4 Z33
LS74 Z34
MREQ
JP1
JP2
14503B Z57
TD'
SD
MCTS
RTSCPU
EXT CLK
OPT
CS28
74LS174 Z58
RAM
RBM
RCM
RDM
EEV
CS29
LS138 Z13
CS24
CS25
CS26
CS27
CS28
CS29
CS30
CS31
LS138 Z12
CS8
CS9
CS10
CS11
CS12
CS13
CS14
CS15
74LS174 Z59
EXT
SELF TEST
DTR'
TTLI
GO
CS30
14503B Z14
XSTB
BSY
EXCL
RSTBI
RCB
RSTBO
CS27
14503B Z16
GATE
DONE
GLITCH
RDB
RDG
RD7
CS12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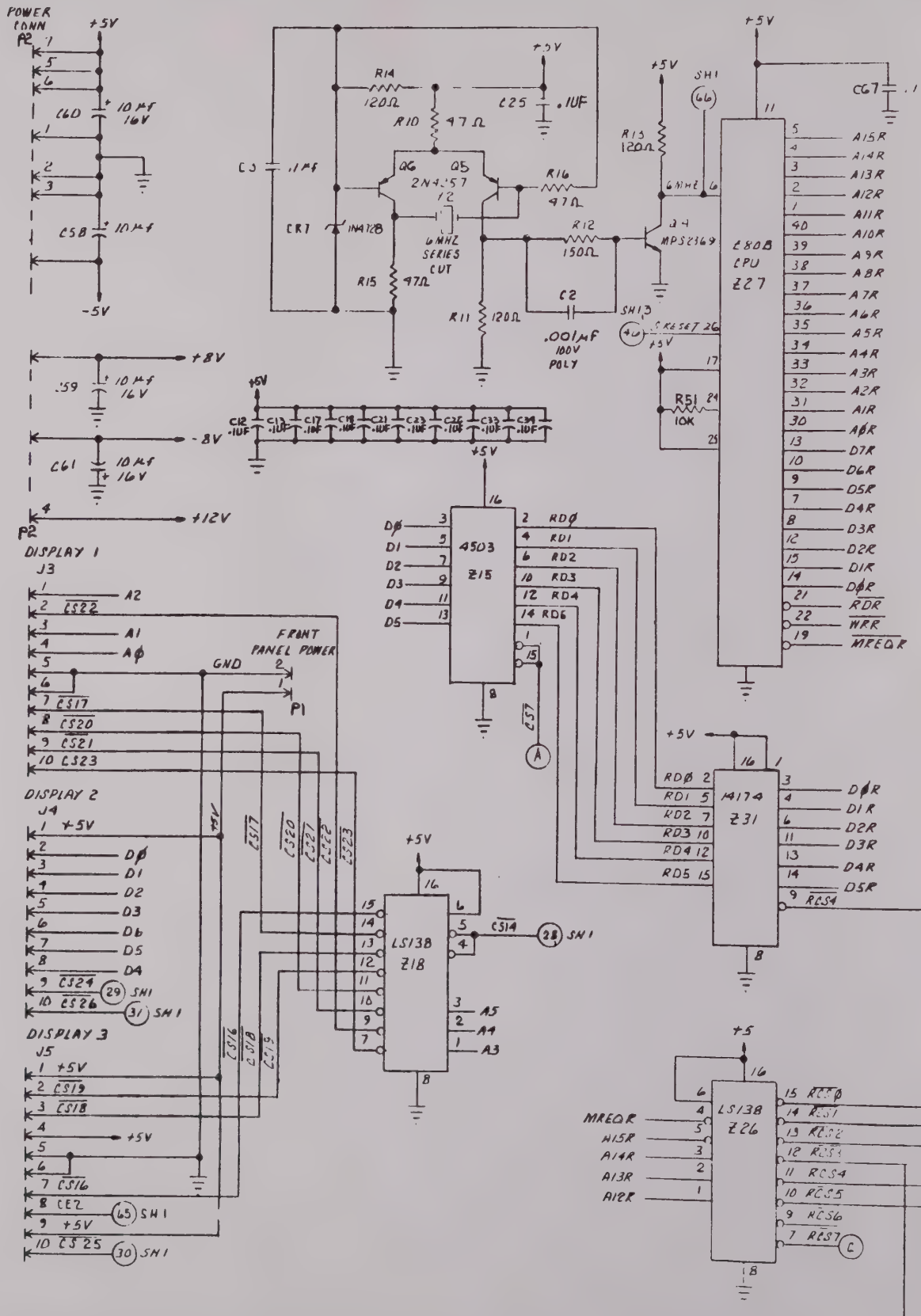
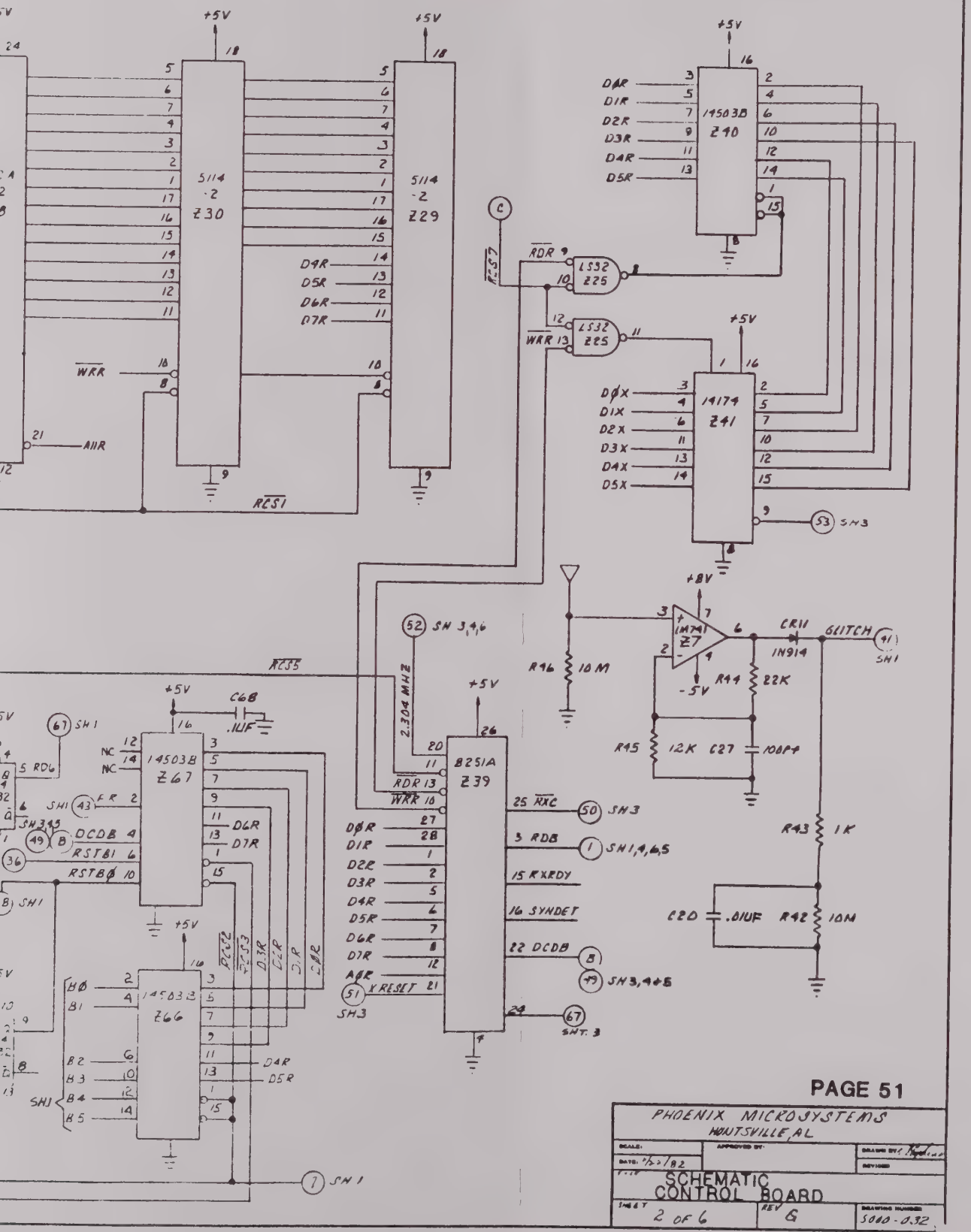
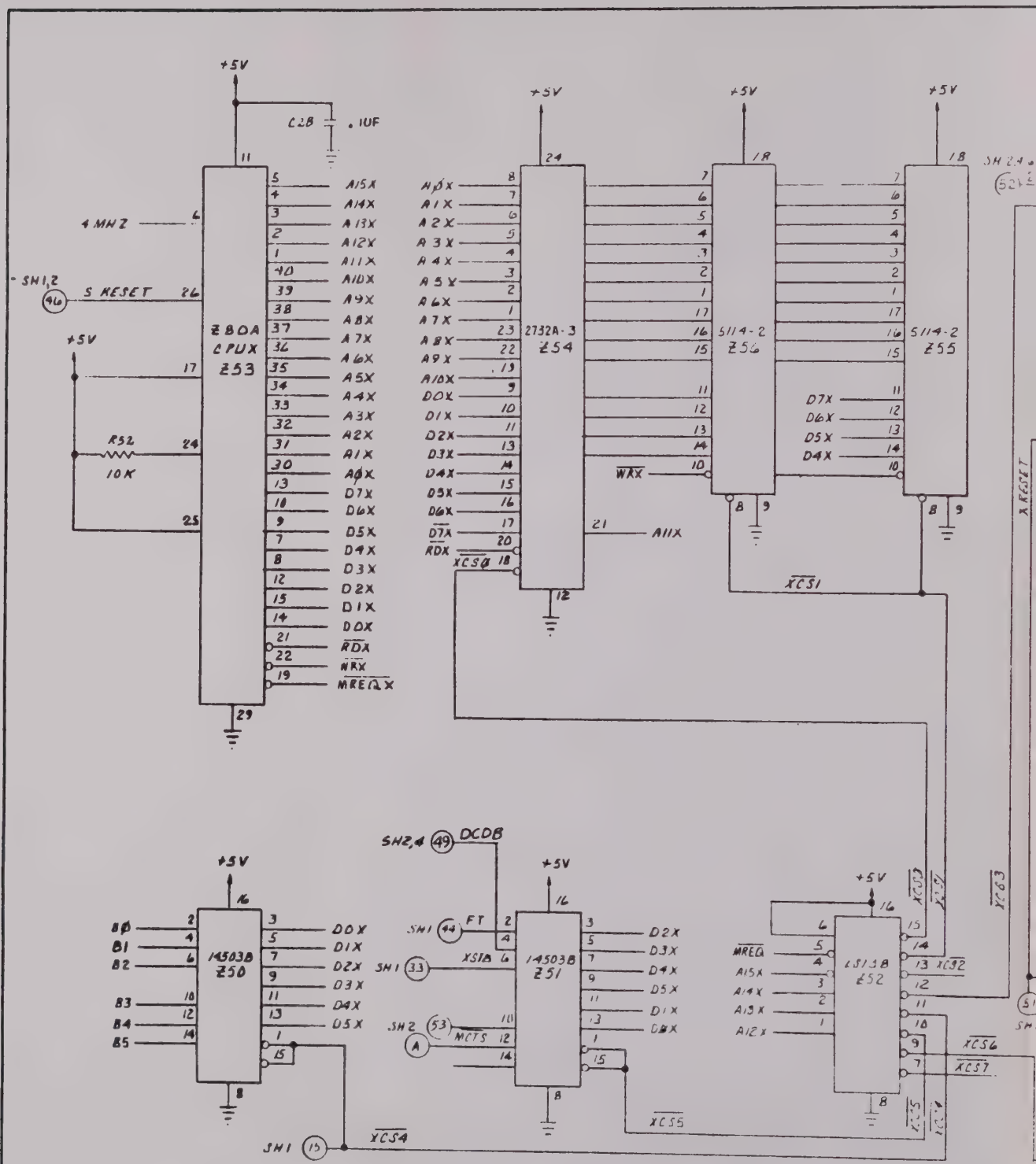
INC. ECO. 5000-8.0 KWG. 4-27-84
+5V
C15 .1UF
C14 .1UF
R32 100K
CR3 IN914
R35 100K
C11 33MF 16V MSR
R38 220K
R39 160K
+12V
CR6 IN914
R40 390Ω
BT1 9V NICAD
Z1 E808
Z2 2732A-3
Z3 2732A-3
Z4 2764-3 OR 2732A-3
Z5 MSM8128 -15RS
LS138 Z11
LS08 Z6
CR4 IN914
CR5 IN914
R33 1K
R36 1K
R21 10Ω
SPI 14AR06C
Q12 2N3904
Q13 2N3904
R34 12K
R37 12K
Q8 TIP110
R22 1K
C63 1mf 16V
R23 4.7K
CR9 IN270
LS74 Z63
LS174 Z65
LS32 Z25
PAGE 50
PHOENIX MICROSYSTEMS
HUNTSVILLE, ALABAMA
SCHEMATIC CONTROL BD. 5000 MODEM
5000-832


POWER CONN
P2
+5V
C60 10 µF 16V
C58 10 µF
-5V
+8V
.59 10 µF 16V
-8V
C61 10 µF 16V
+12V
R14 120Ω
R10 47Ω
C25 .1UF
C3 .1µF
Q6 Q5 2N4257
CR1 IN4728
6 MHZ SERIES CUT
R15 47Ω
R11 120Ω
R16 47Ω
R12 150Ω
Q4 MPS2369
C2 .001µF 100V POLY
R13 120Ω
SH1
C67 .1
Z80B CPU Z27
A15R A14R A13R A12R A11R A10R A9R A8R A7R A6R A5R A4R A3R A2R A1R A0R
D0R D1R D2R D3R D4R D5R D6R D7R
RDR WRR MREQR
RESET
R51 10K
C12 C13 C17 C18 C21 C23 C32 C33 C34 .1UF
4503 Z15
D0 D1 D2 D3 D4 D5
RD0 RD1 RD2 RD3 RD4 RD6
CS7
A
14174 Z31
RD0 RD1 RD2 RD3 RD4 RD5
D0R D1R D2R D3R D4R D5R
RCS4
DISPLAY 1
J3
A2 A1 A0
CS22 CS17 CS20 CS21 CS23
FRONT PANEL POWER
GND
P1
DISPLAY 2
J4
+5V
D0 D1 D2 D3 D4 D5 D6 D7
CS24 CS26
DISPLAY 3
J5
CS19 CS18 CE2 CS25 CS16
LS138 Z18
CS14
A5 A4 A3
LS138 Z26
MREQR WR5R A14R A13R A12R
RCS0 RCS1 RCS2 RCS3 RCS4 RCS5 RCS6 RCS7
C
B


+5V
5114 -2 Z30
5114 -2 Z29
WRR
AIIR
RCS1
D4R
D5R
D6R
D7R
14503B Z40
D0R
D1R
D2R
D3R
D4R
D5R
LS32 Z25
RDR
WRR
RCS7
14174 Z41
D0X
D1X
D2X
D3X
D4X
D5X
SN3
+8V
1/4 LM741 Z7
-5V
R46 10M
R44 22K
R45 12K
C27 100PF
CR11 IN914
GLITCH
SH1
R43 1K
C20 .01UF
R42 10M
2.304 MHZ
B251A Z39
RCS3
SN 3,4,6
25 RXC
3 RDB
15 RXRDY
16 SYNDET
22 DCDB
24 SYNT. 3
D0R
D1R
D2R
D3R
D4R
D5R
D6R
D7R
A0R
X RESET
SH3
C68 .1UF
14503B Z67
NC
RD6
FR
DCDB
RSTB1
RSTB0
DL6R
D7R
14503B Z66
B0
B1
B2
B3
B4
B5
D4R
D5R
SH1
PAGE 51
PHOENIX MICROSYSTEMS
HOUTSVILLE, AL
SCHEMATIC
CONTROL BOARD
2 OF 6
REV G
5000-0.32


+5V
C28
.10F
Z80A CPU X Z53
4 MHZ
SH1,2
S RESET
R52
10K
A15X
A14X
A13X
A12X
A11X
A10X
A9X
A8X
A7X
A6X
A5X
A4X
A3X
A2X
A1X
A0X
D7X
D6X
D5X
D4X
D3X
D2X
D1X
D0X
RDX
WRX
MREQX
2732A-3 Z54
5114-2 Z56
5114-2 Z55
WRX
A11X
XCS0
XCS1
X RESET
SH2,4
DCDB
SH1
FT
XSIA
SH2
MCTS
14503B Z50
14503B Z51
LS138 Z52
MREQ
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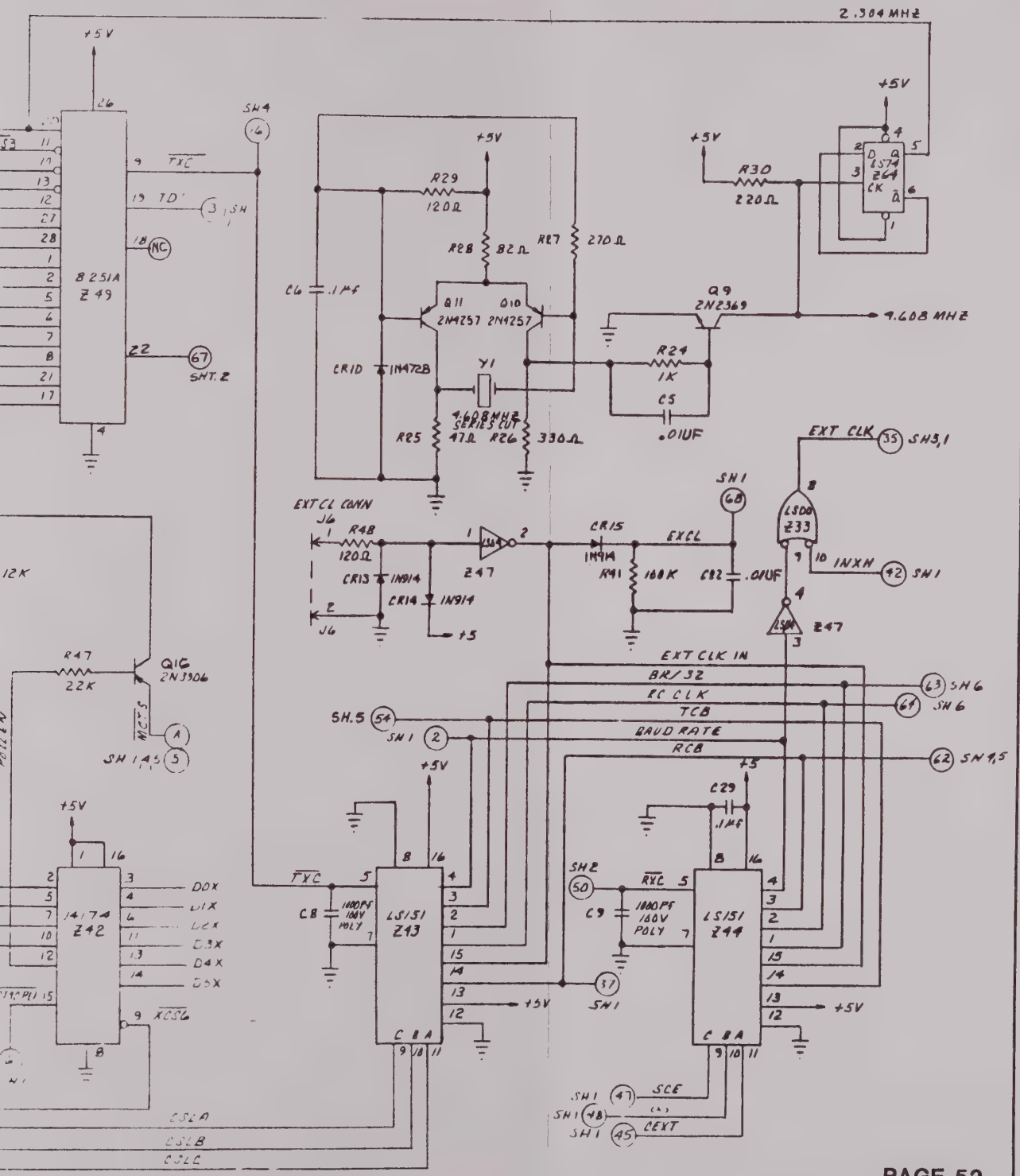
XCS3
XCS4
XCS5
XCS6
XCS7




**PAGE 52**

PHOENIX MICROSYSTEMS
HUNTSVILLE, AL

| | | |
|---|---|---|
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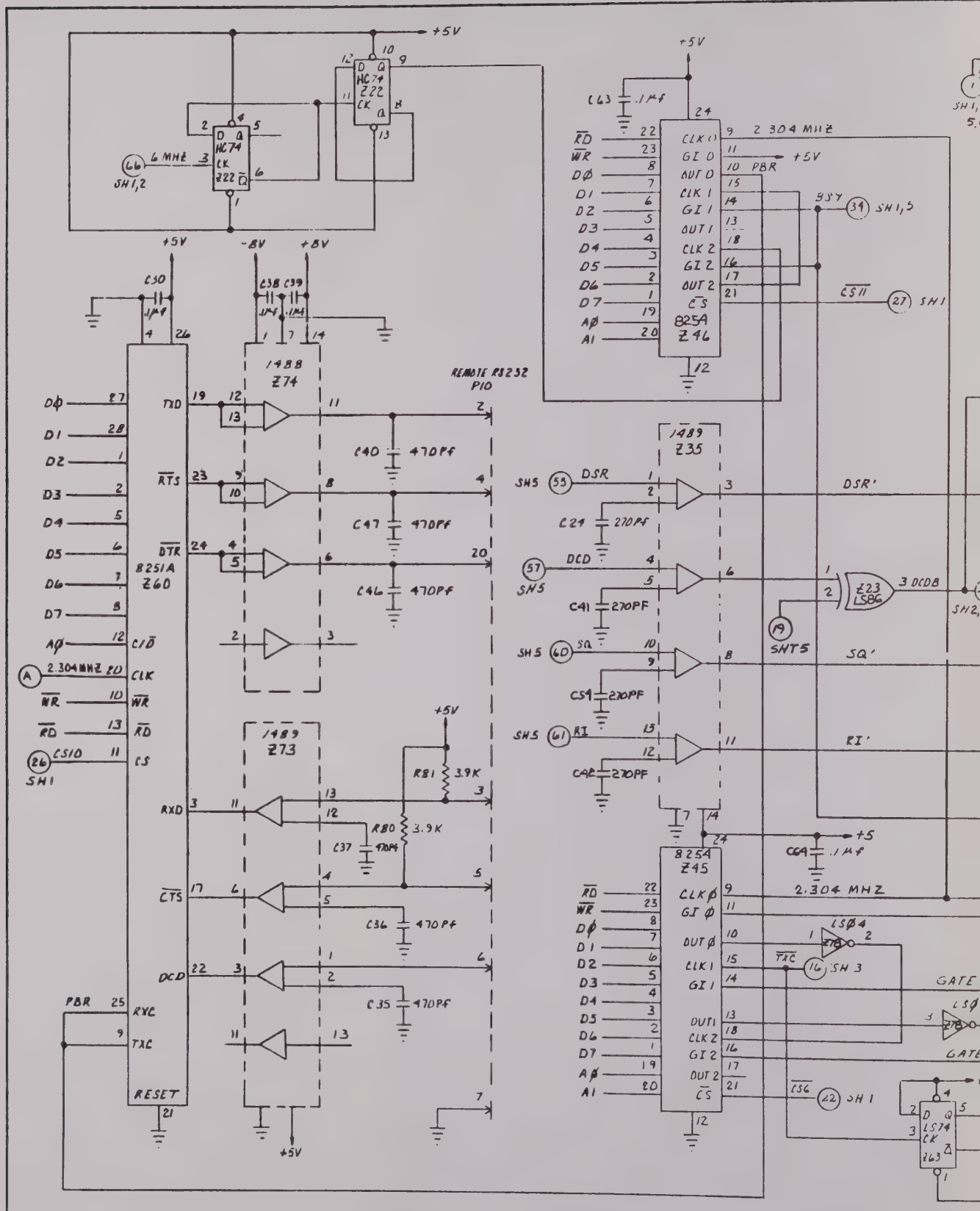
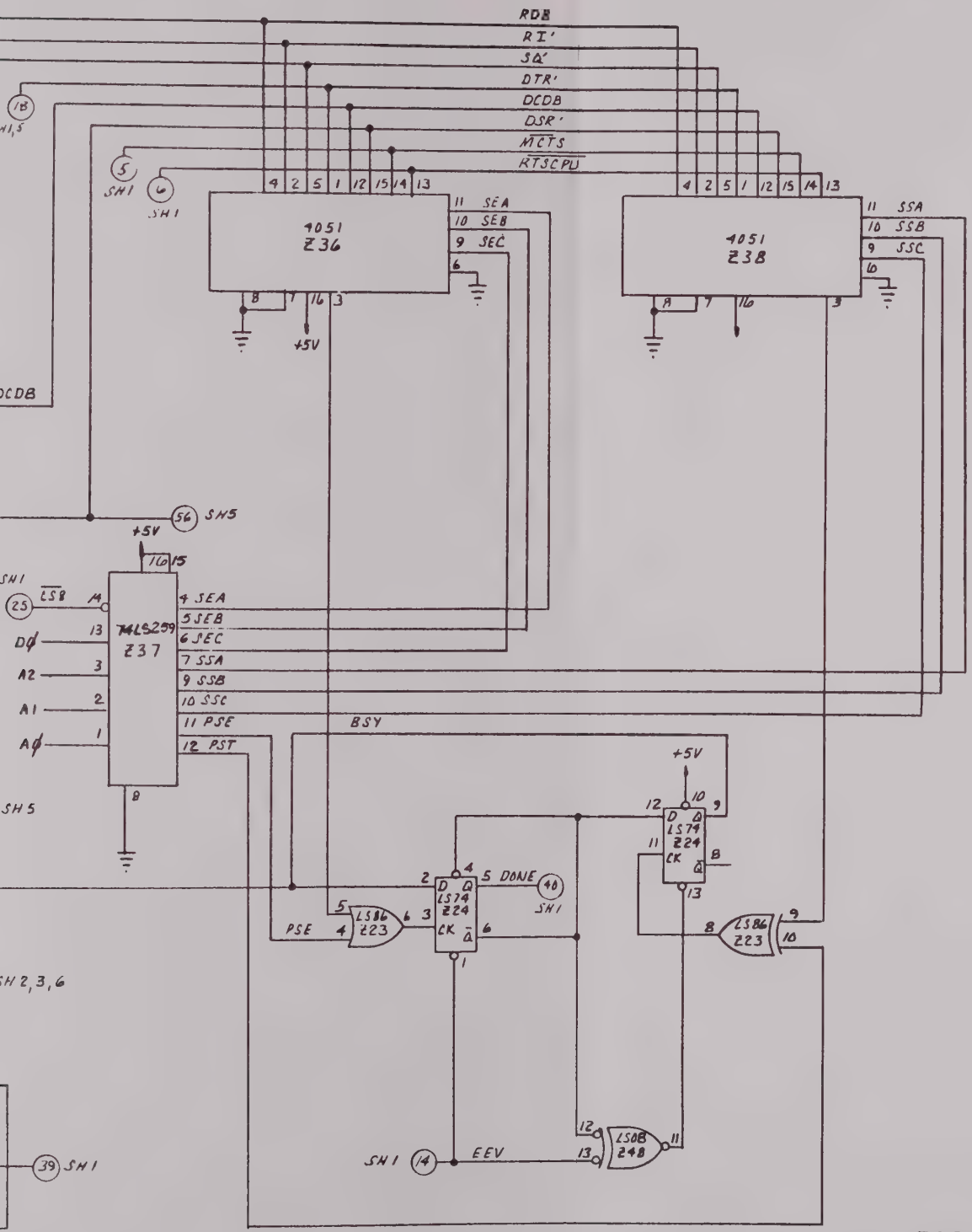
| SHEET 3 OF 6 | REV G | DRAWING NUMBER 5000-032 |


+5V
74HC74 Z22
6 MHz
SH1,2
-8V
+8V
C30 .1µF
C38 .1µF
C39 .1µF
1488 Z74
REMOTE RS232 PIO
8251A Z60
TXD
RTS
DTR
C/D
CLK
WR
RD
CS
CS10
SH1
RXD
CTS
DCD
RXC
TXC
RESET
C40 470PF
C47 470PF
C46 470PF
C36 470PF
C35 470PF
C37 470PF
RB1 3.9K
RB0 3.9K
1489 Z73
1489 Z35
DSR
DCD
SQ
RI
C24 270PF
C41 270PF
C59 270PF
C48 270PF
SH5
SH7
3 DCDB
DSR'
SQ'
RI'
8254 Z45
2.304 MHz
C63 .1µF
C64 .1µF
PBR
GATE
SH3
SH2,
SH1,5




PAGE 53

| PHOENIX MICROSYSTEMS HUNTSVILLE, AL | | |
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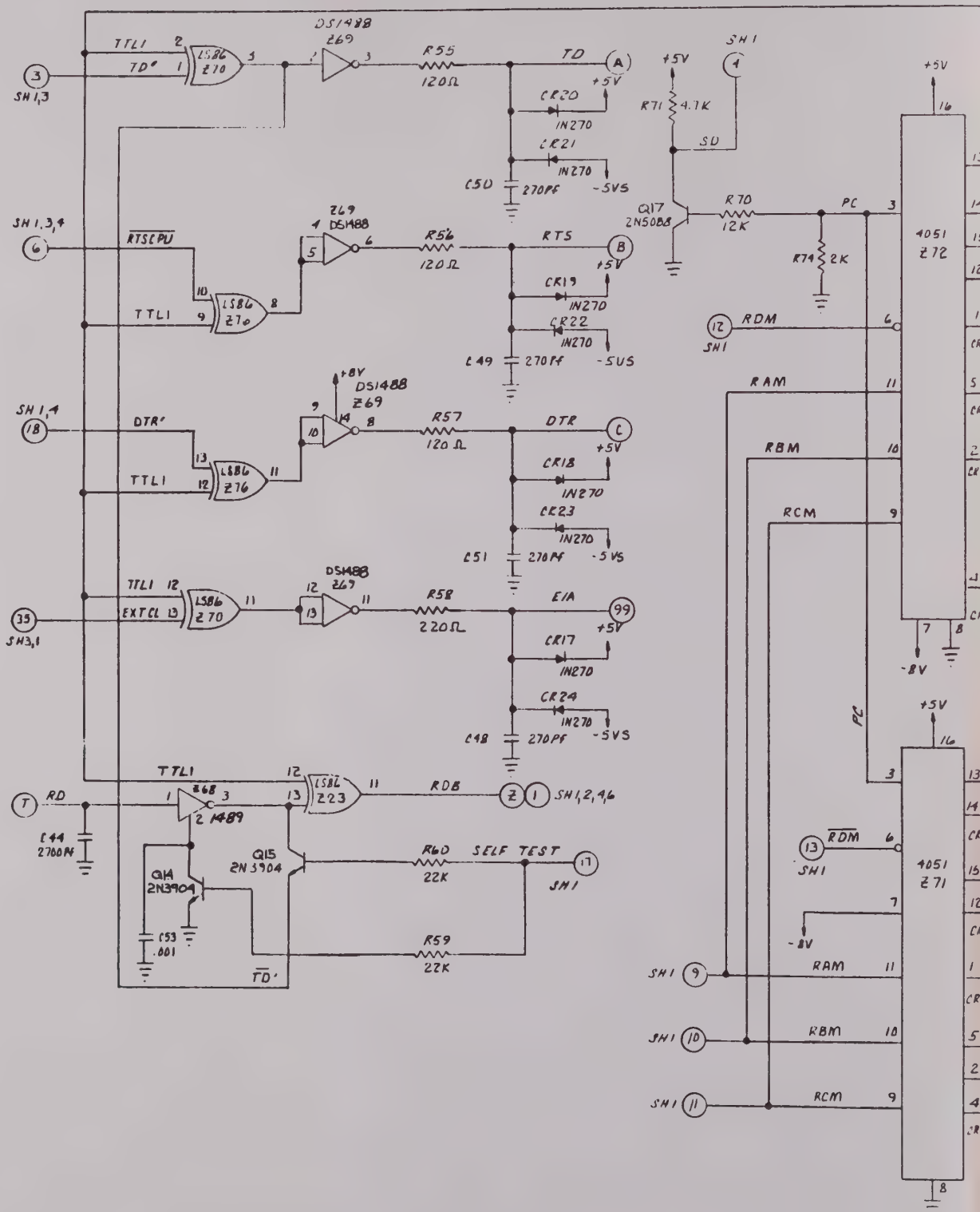
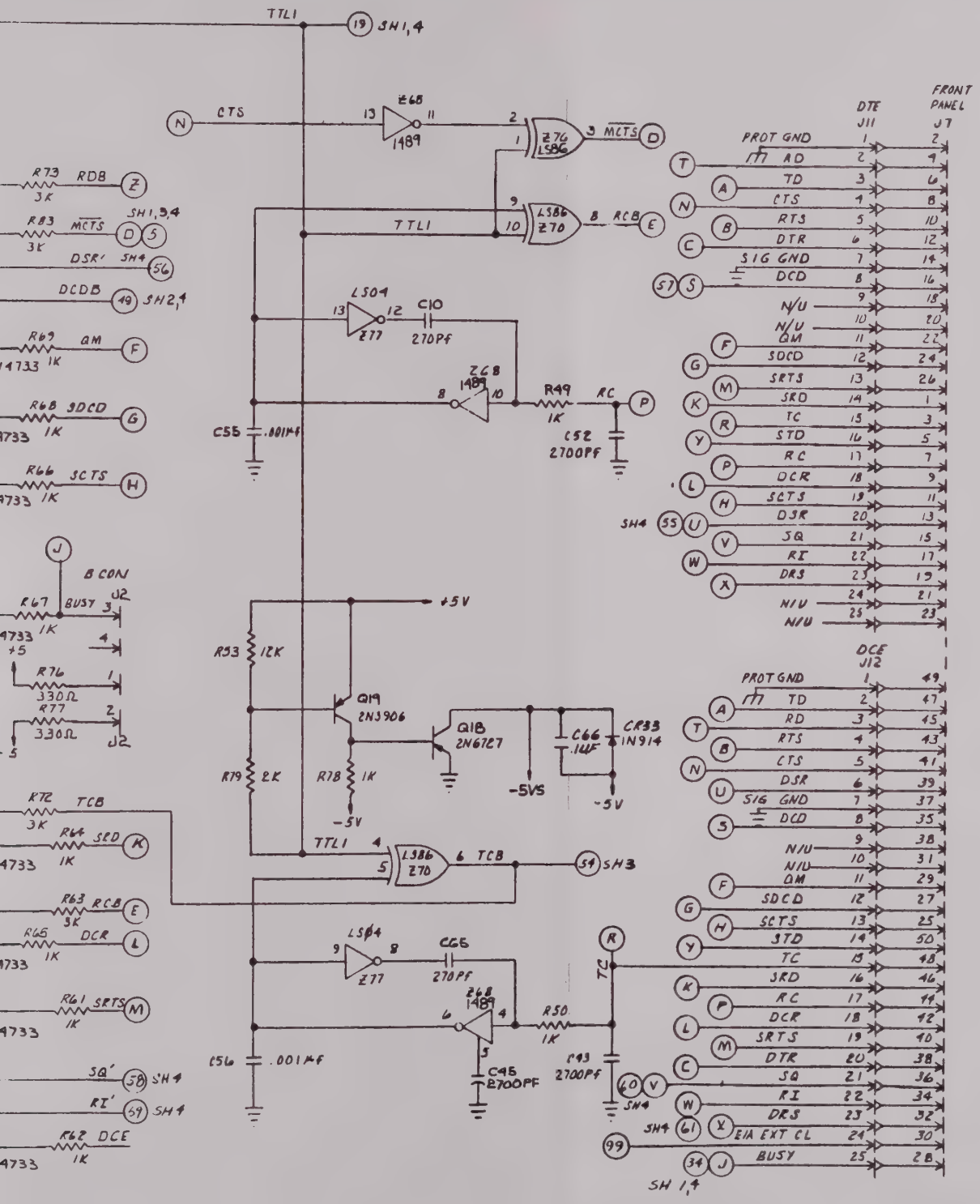
| SHEET: 4 OF 6 | REV: G | DRAWING NUMBER: 5000-032 |


DS1488
Z69
TTL1
TD'
LS86
Z70
SH1,3
R55
120Ω
TD
A
+5V
CR20
IN270
CR21
IN270
C50
270PF
-5VS
SH1,3,4
RTSCPU
RTS
B
R56
120Ω
CR19
IN270
CR22
IN270
C49
270Pf
-5VS
+8V
SH1,4
DTR'
DTR
C
R57
120Ω
CR18
IN270
CR23
IN270
C51
270Pf
-5VS
SH3,1
EXTCL
EIA
99
R58
220Ω
CR17
IN270
CR24
IN270
C48
270PF
-5VS
RD
Z68
Z 1489
LS86
Z23
RDB
Z
1
SH1,2,4,6
C44
2700Pf
Q14
2N3904
Q15
2N3904
R60
22K
SELF TEST
17
SH1
C53
.001
R59
22K
TD'
R71
4.7K
SD
Q17
2N5088
R70
12K
PC
R74
2K
4051
Z72
RDM
SH1
RAM
RBM
RCM
-8V
4051
Z71
SH1,9
SH1,10
SH1,11

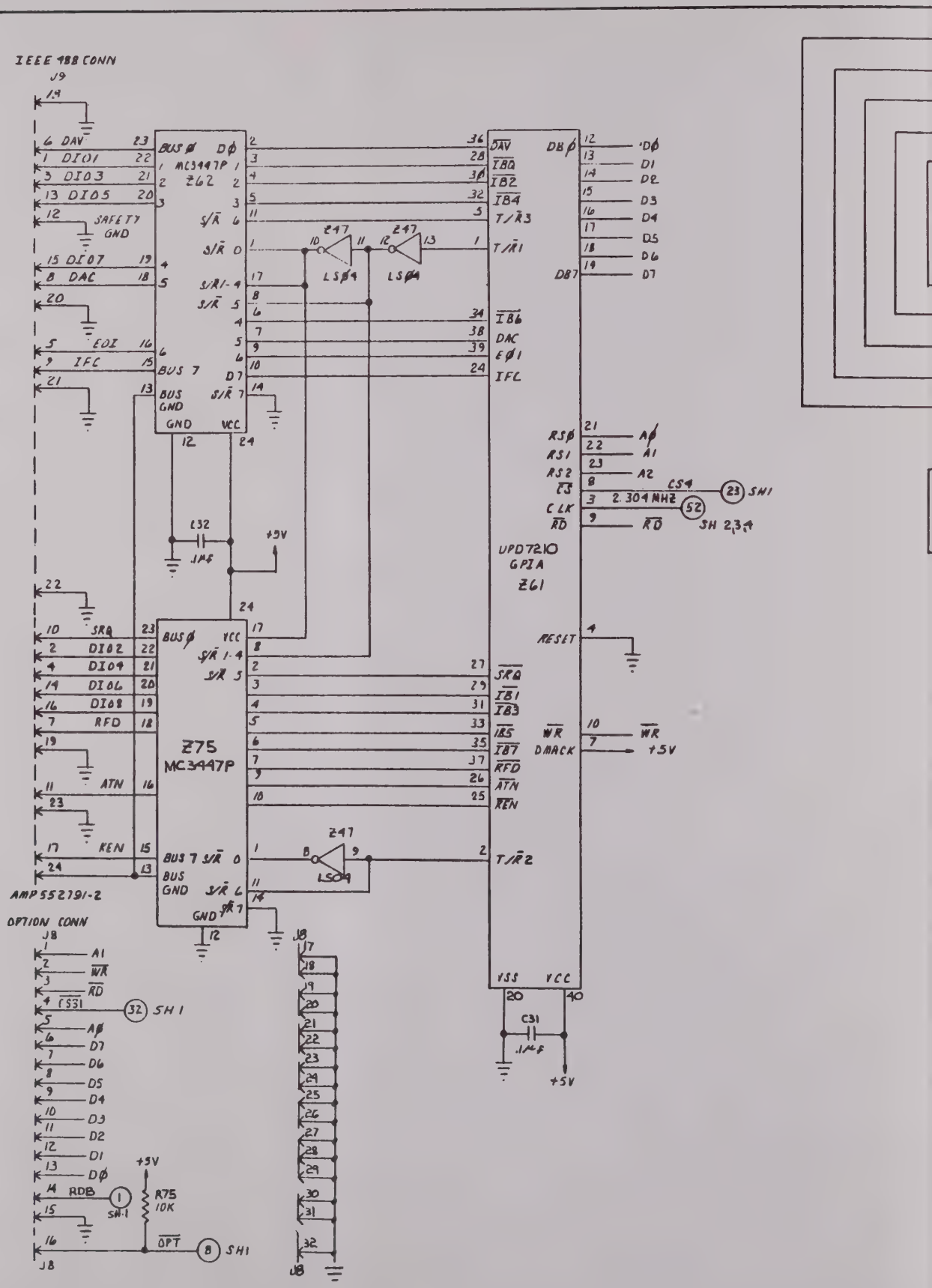


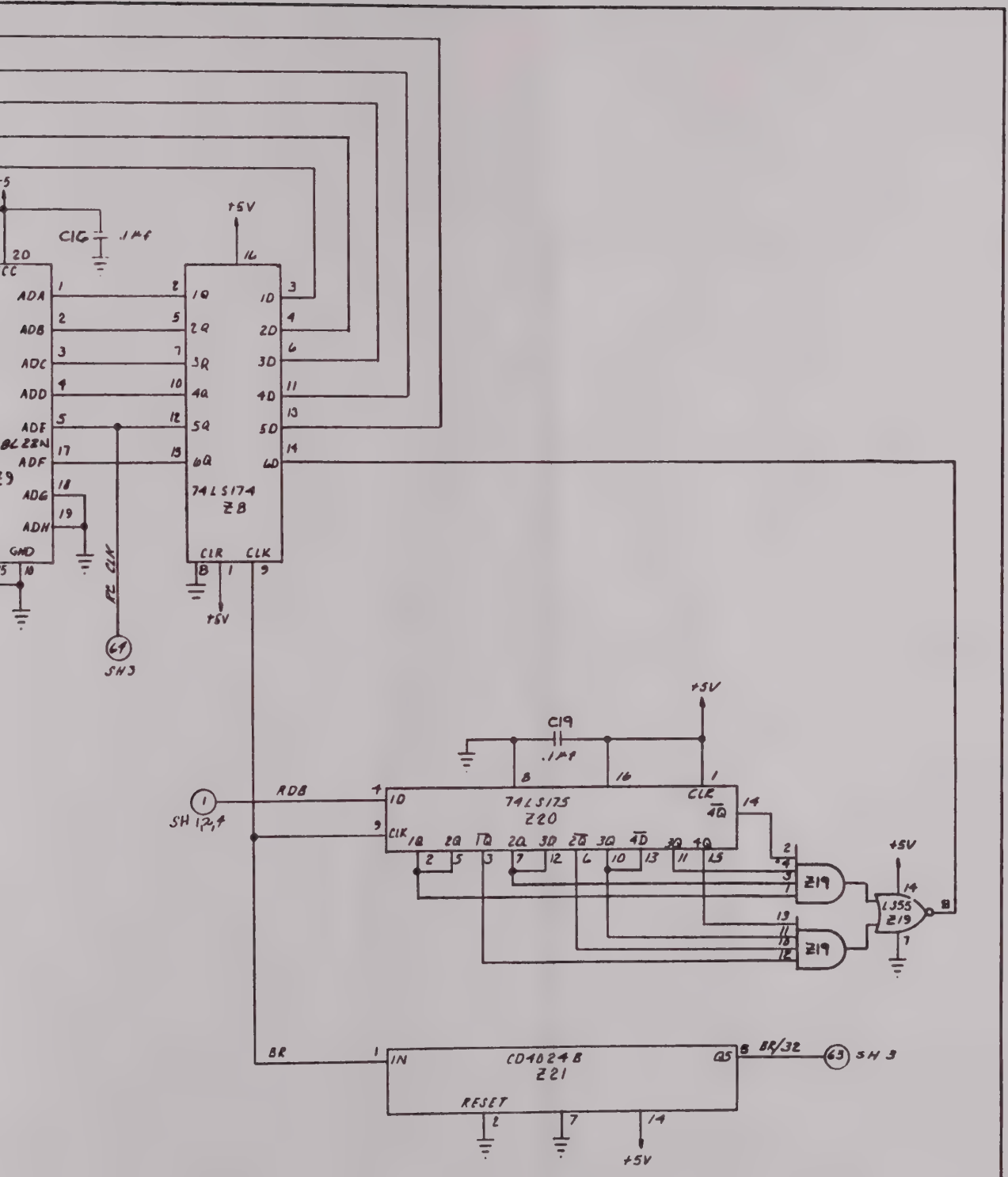

PAGE 54

| | | |
|---|---|---|
| SCALE: | APPROVED BY: | DRAWN BY: K. Shankland |
| DATE: 11/24/82 | | REVISED |

SCHEMATIC
CONTROL BOARD

| SHEET | REV | DRAWING NUMBER |
|---|---|---|
| 5 OF 6 | G | 5000-032 |


IEEE 488 CONN
J9
DAV
DIO1
DIO3
DIO5
SAFETY GND
DIO7
DAC
EOI
IFC
BUS GND
GND
BUS Ø
MC3447P
Z62
S/R 0
S/R 1-4
S/R 5
BUS 7
S/R 7
VCC
C32
.1MF
+5V
SRQ
DIO2
DIO4
DIO6
DIO8
RFD
ATN
REN
Z75
MC3447P
S/R 6
AMP 552791-2
OPTION CONN
J8
A1
WR
RD
CS31
SH 1
A0
D7
D6
D5
D4
D3
D2
D1
D0
RDB
SW-1
R75
10K
OPT
SH 1
74LS04
74LS04
74LS04
74LS04
DAV
IBØ
IB2
IB4
T/R3
T/R1
IB6
DAC
EØI
IFC
T/R2
DB Ø
DB7
RSØ
RS1
RS2
CS
CLK
RD
UPD7210
GPIA
Z61
RESET
SRQ
IB1
IB3
IB5
IB7
RFD
ATN
REN
WR
DMACK
VSS
VCC
C31
.1MF
+5V
2.304 MHZ
CS4
SH 1
SH 2,3,4



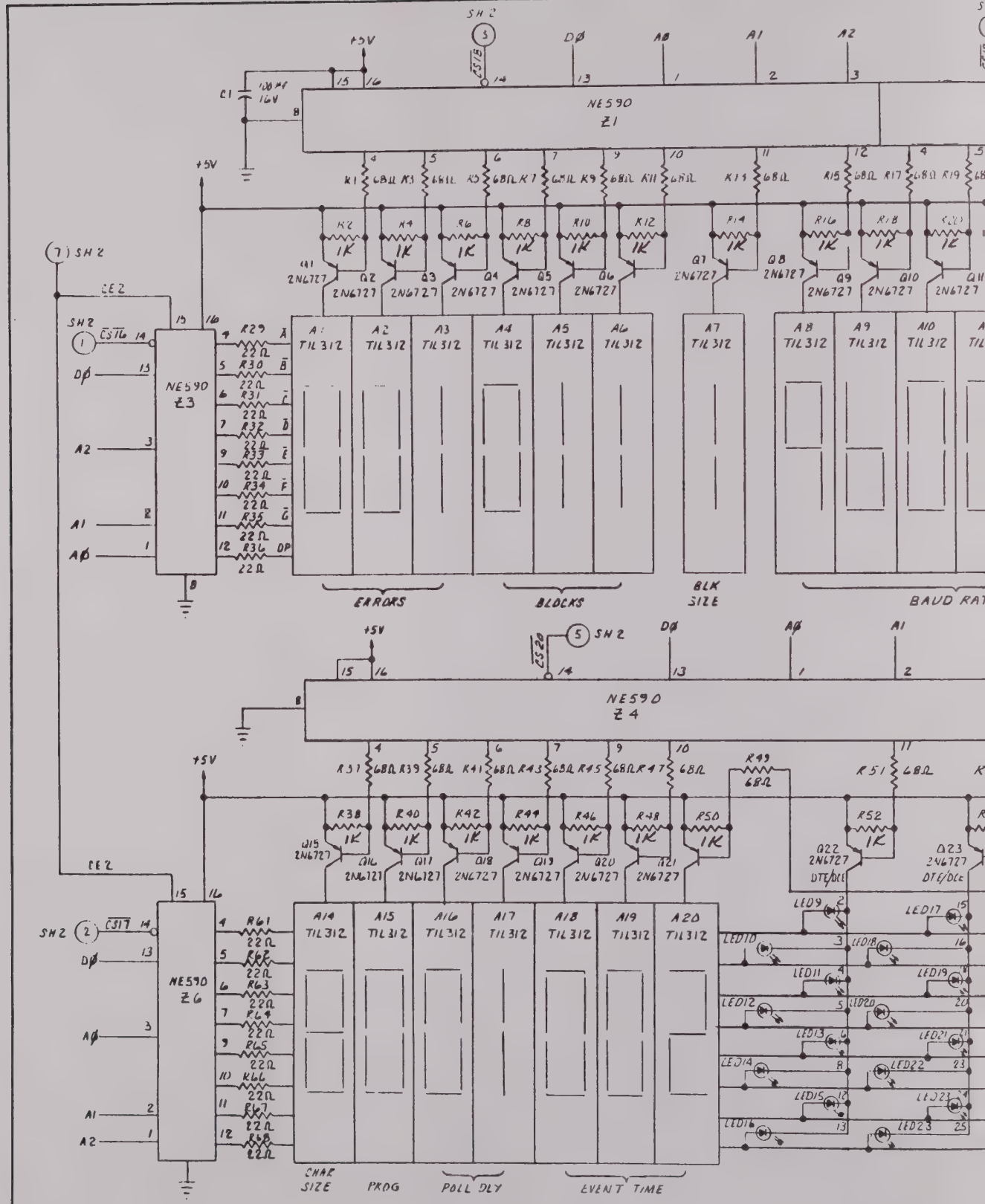


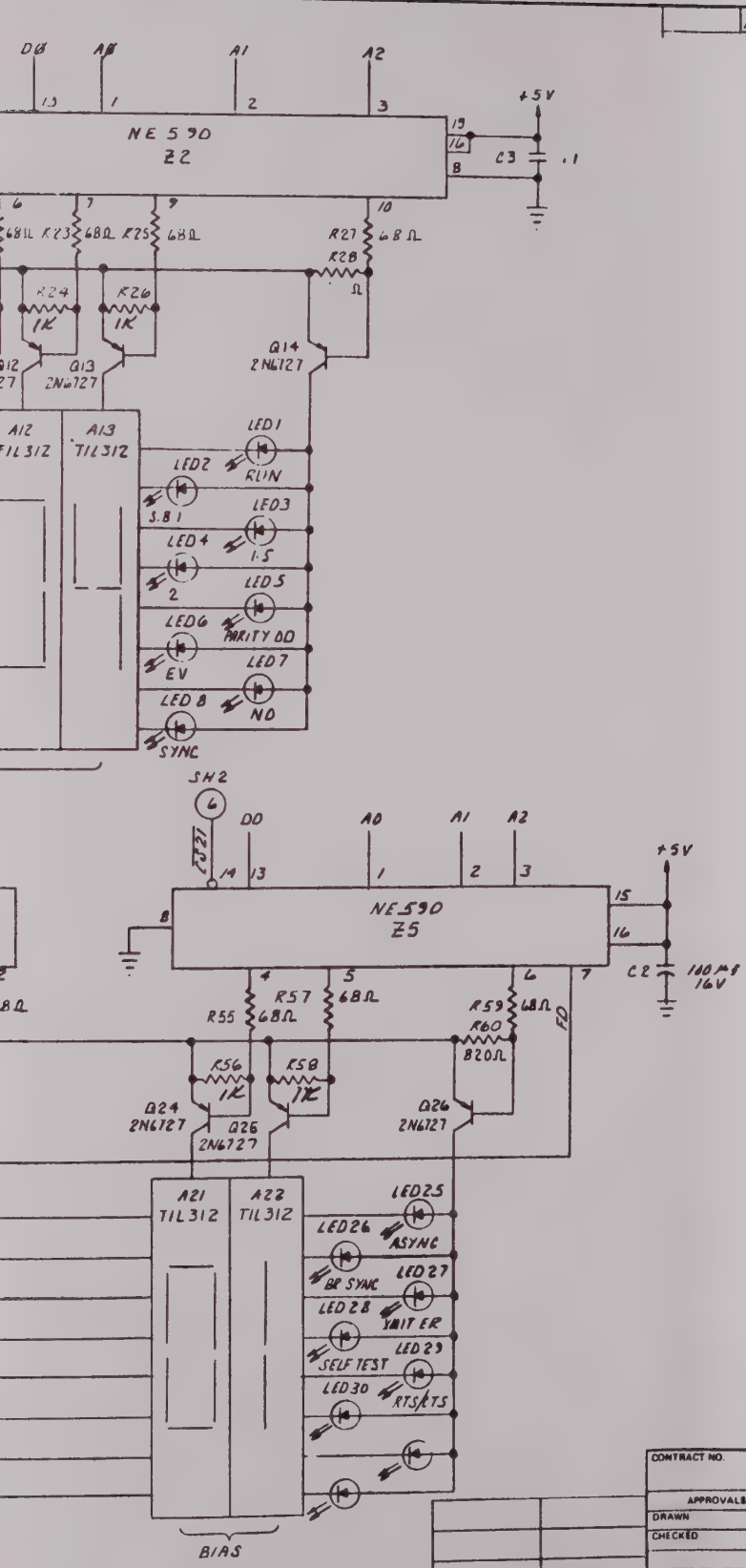

PHOENIX MICROSYSTEMS
HUNTSVILLE, AL

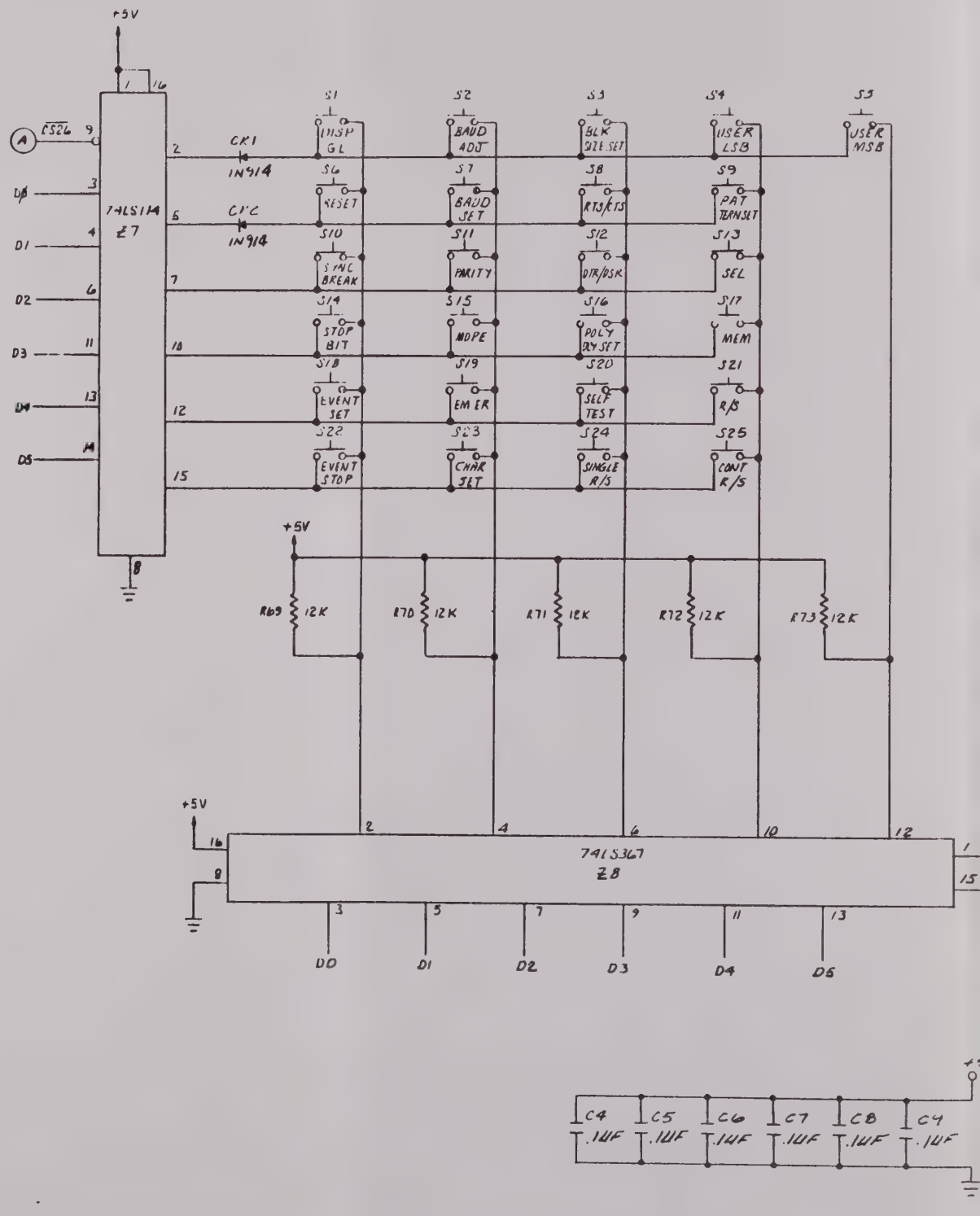
SCALE:
DATE: 11/24/82
APPROVED BY:
DRAWN BY: S. Nelms
REVISED

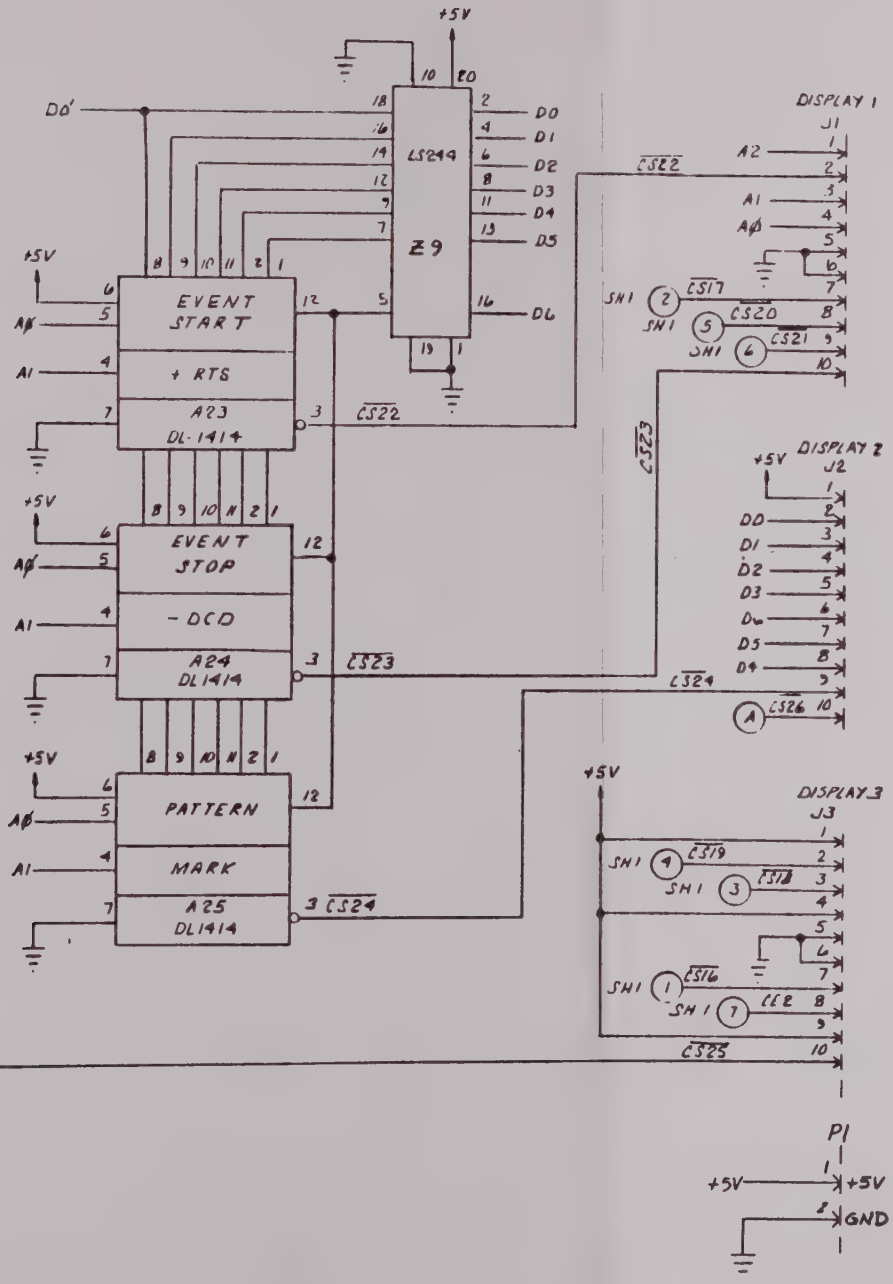
SCHEMATIC
CONTROL BOARD

SHEET 6 OF 6
REV G
DRAWING NUMBER 5000-032


NE590 Z1
NE590 Z3
NE590 Z4
NE590 Z6
+5V
C1 100 MF 16V
R1 68Ω R3 68Ω R5 68Ω R7 68Ω R9 68Ω R11 68Ω R13 68Ω R15 68Ω R17 68Ω R19
R2 1K R4 1K R6 1K R8 1K R10 1K R12 1K R14 1K R16 1K R18 1K R20 1K
Q1 2N6727 Q2 2N6727 Q3 2N6727 Q4 2N6727 Q5 2N6727 Q6 2N6727 Q7 2N6727 Q8 2N6727 Q9 2N6727 Q10 2N6727
A1 TIL312 A2 TIL312 A3 TIL312 A4 TIL312 A5 TIL312 A6 TIL312 A7 TIL312 A8 TIL312 A9 TIL312 A10 TIL312
ERRORS
BLOCKS
BLK SIZE
BAUD RA
R29 22Ω R30 22Ω R31 22Ω R32 22Ω R33 22Ω R34 22Ω R35 22Ω R36 22Ω
R37 68Ω R39 68Ω R41 68Ω R43 68Ω R45 68Ω R47 68Ω R49 68Ω R51 68Ω
R38 1K R40 1K R42 1K R44 1K R46 1K R48 1K R50 1K R52 1K
Q15 2N6727 Q16 2N6727 Q17 2N6727 Q18 2N6727 Q19 2N6727 Q20 2N6727 Q21 2N6727 Q22 2N6727 Q23 2N6727
DTE/DCE
A14 TIL312 A15 TIL312 A16 TIL312 A17 TIL312 A18 TIL312 A19 TIL312 A20 TIL312
CHAR SIZE
PROG
POLL DLY
EVENT TIME
LED9 LED10 LED11 LED12 LED13 LED14 LED15 LED16 LED17 LED18 LED19 LED20 LED21 LED22 LED23

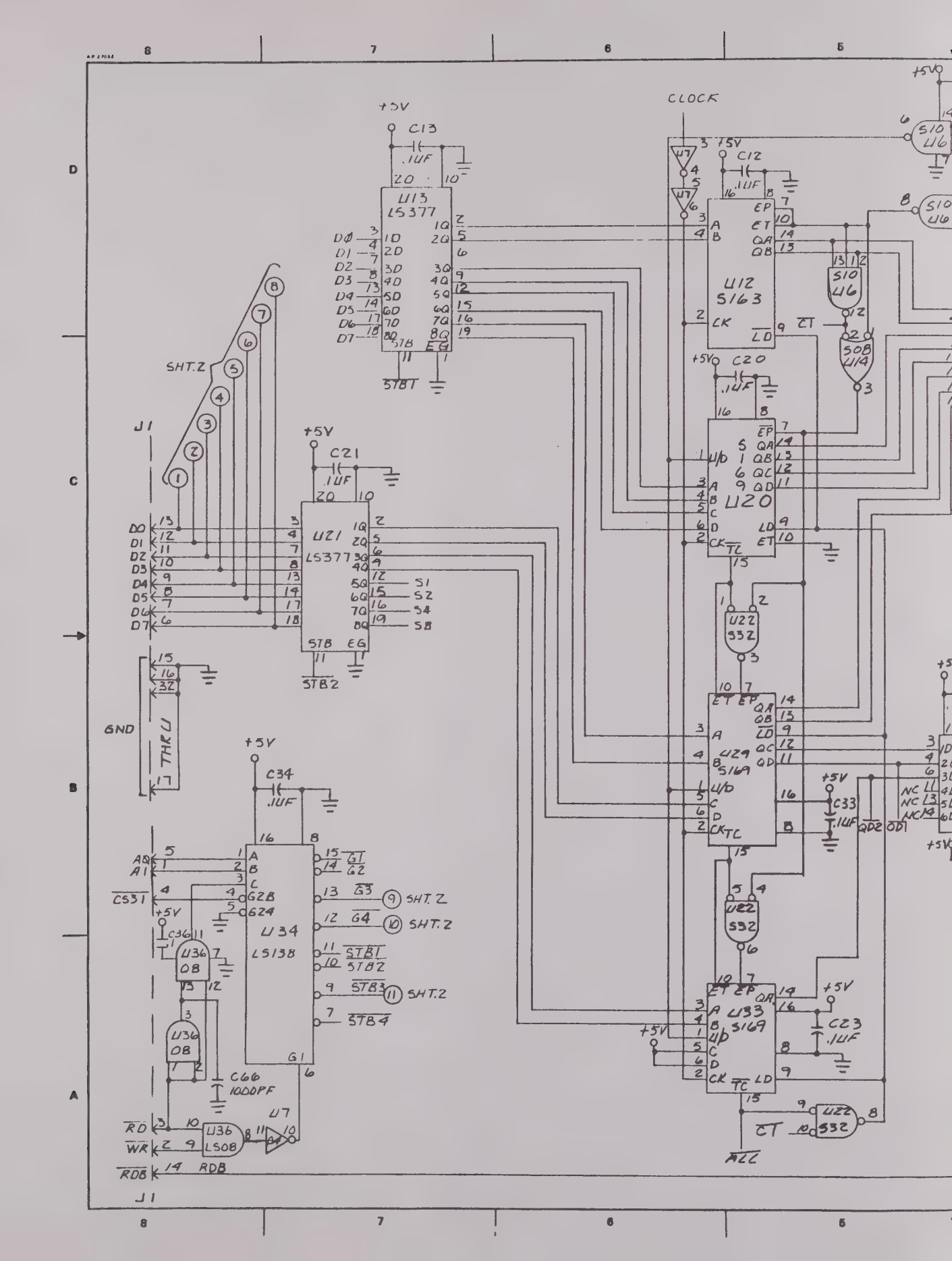

REV
INC ECO 5000-1.0 MWB 12/13/83
D0
A0
A1
A2
NE 590
Z2
+5V
C3 .1
R27 68Ω
R28 Ω
R24 1K
R26 1K
Q14 2N6727
Q13 2N6727
A12 TIL312
A13 TIL312
LED1 RUN
LED2 3.81
LED3 1.5
LED4 2
LED5 PARITY OD
LED6 EV
LED7 NO
LED8 SYNC
SW2
D0
A0
A1
A2
NE590
Z5
+5V
C2 100µf 16V
R57 68Ω
R55 68Ω
R59 68Ω
R60 820Ω
R56 1K
R58 1K
Q24 2N6727
Q26 2N6727
Q26 2N6727
A21 TIL312
A22 TIL312
LED25
LED26 ASYNC
LED27 BR SYNC
LED28 WAIT ER
LED29 SELF TEST
LED30 RTS/CTS
BIAS
CONTRACT NO.
APPROVALS
DATE
DRAWN
CHECKED
FINAL
MODEM
NEXT ASSY
USED ON
APPLICATION
PHOENIX MICROSYSTEMS
HUNTSVILLE, ALABAMA
TITLE
SCHEMATIC
MODEL 5000
FRONT DISPLAY
SIZE D
FSCM NO
DWG NO 5000-012
REV 8
SCALE
SHEET 1 of 2
3
2
1

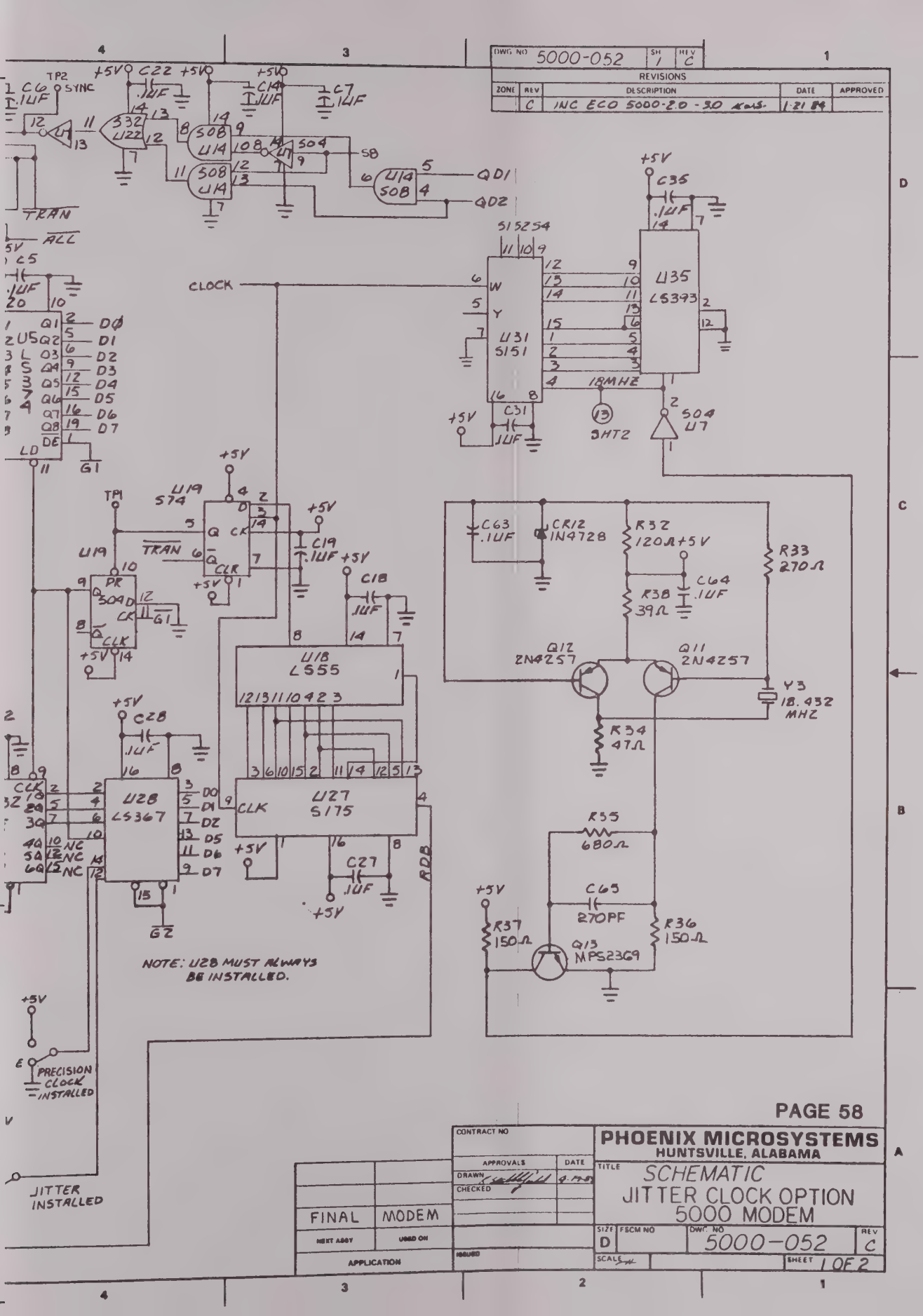

+5V
74LS114
E7
CS26
CK1
IN914
CK2
IN914
D0
D1
D2
D3
D4
D5
S1 MISP GL
S2 BAUD ADJ
S3 BLK SIZE SET
S4 USER LSB
S5 USER MSB
S6 RESET
S7 BAUD SET
S8 RTS/RTS
S9 PAT TRANSET
S10 SYNC BREAK
S11 PARITY
S12 DTR/DSR
S13 SEL
S14 STOP BIT
S15 MODE
S16 POLY DLY SET
S17 MEM
S18 EVENT SET
S19 EMER
S20 SELF TEST
S21 R/S
S22 EVENT STOP
S23 CHAR SET
S24 SINGLE R/S
S25 CONT R/S
R69 12K
R70 12K
R71 12K
R72 12K
R73 12K
74LS367
Z8
C4 .1UF
C5 .1UF
C6 .1UF
C7 .1UF
C8 .1UF
C9 .1UF

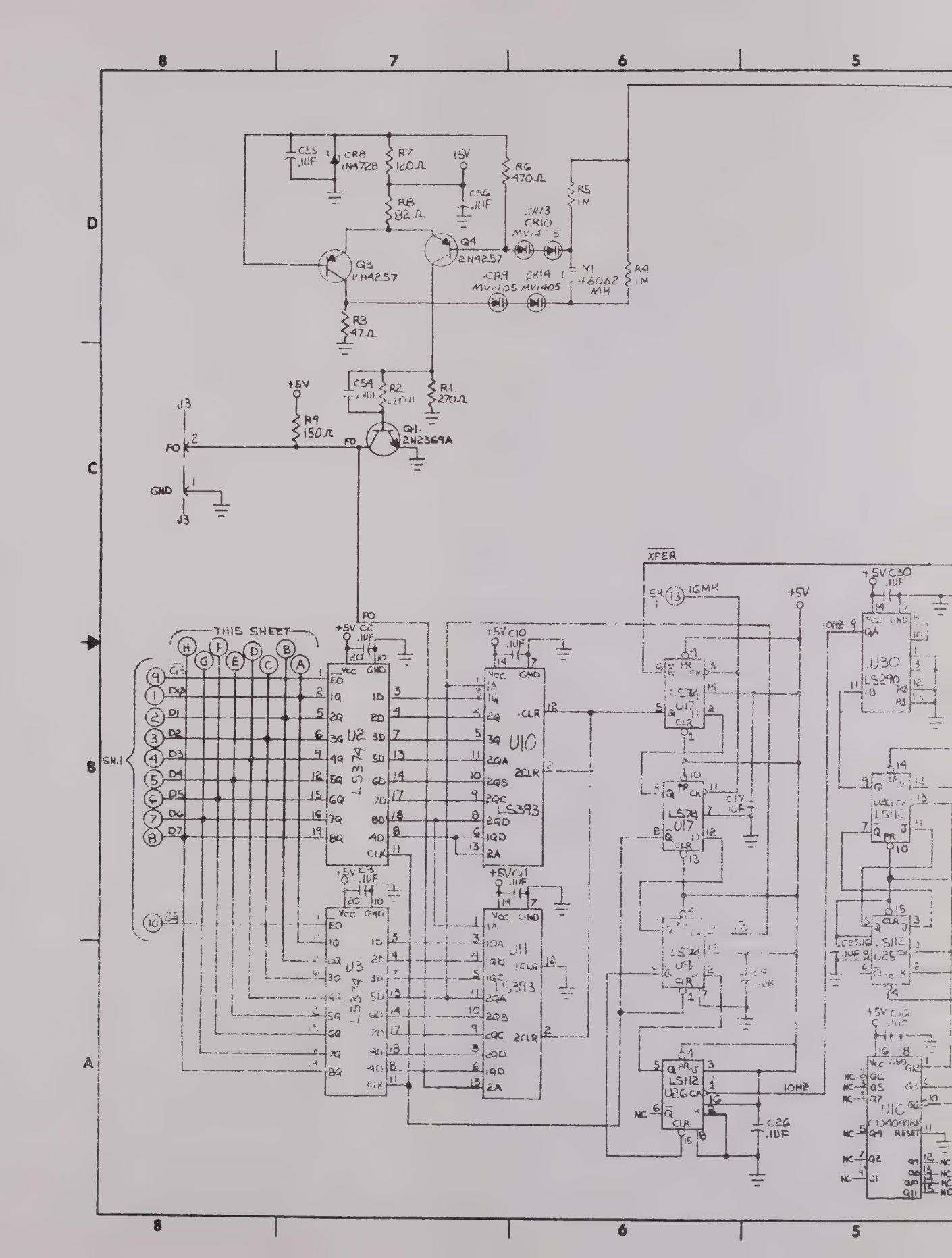


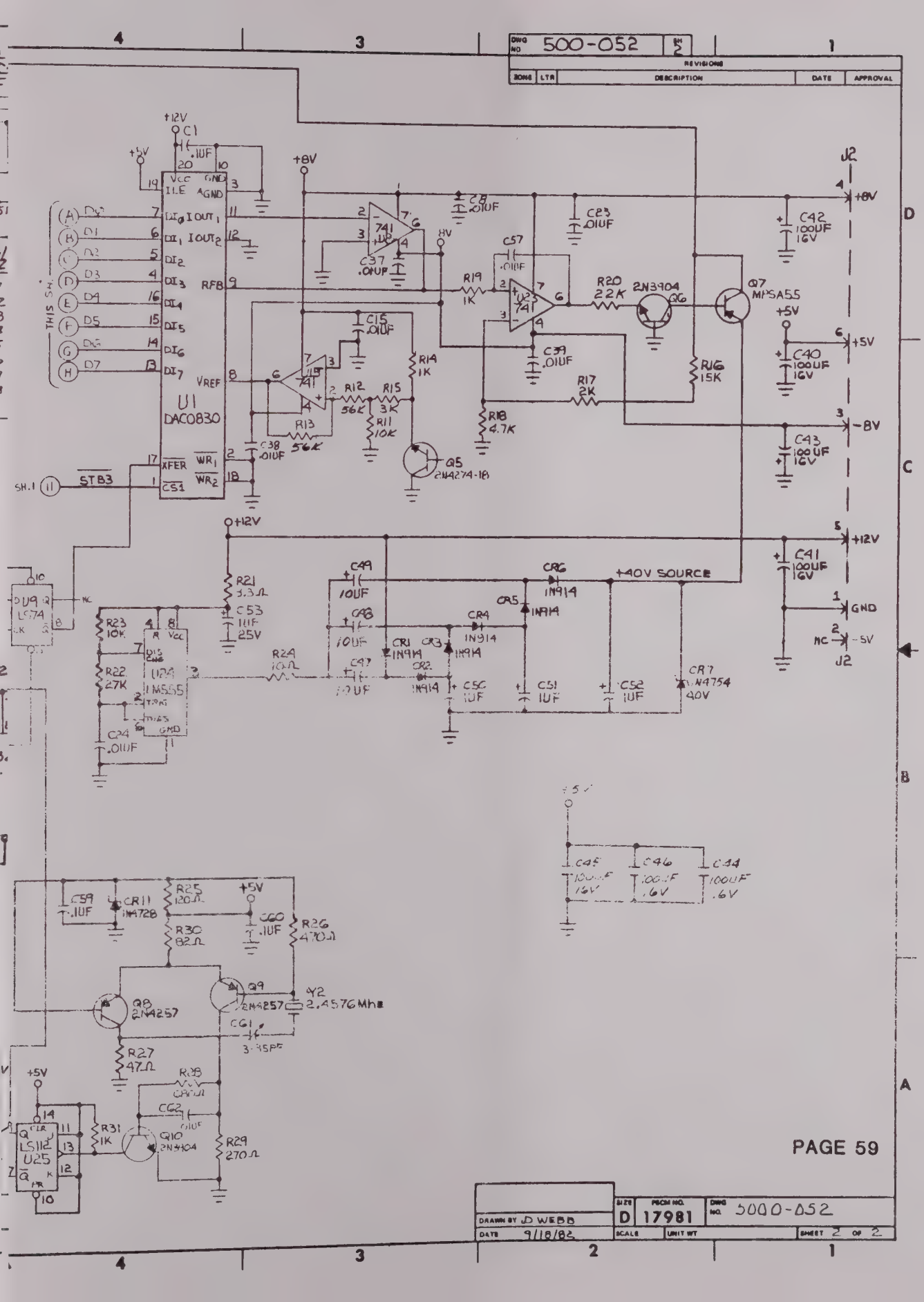



| | | |
|---|---|---|
| PHOENIX MICROSYSTEMS HUNTSVILLE, AL | | |
| SCALE: | APPROVED BY: | DRAWN BY: |
| DATE: 12/1/82 | | DESIGNED |
| TITLE: MODEL 5000 FRONT DISPLAY SCHEMATIC | | |
| SHEET: 2 OF 2 | REV: B | DRAWING NUMBER: 5000-012 |


CLOCK
+5V
C13
.1UF
U13
LS377
D0
D1
D2
D3
D4
D5
D6
D7
STB
STBT
SHT.Z
J1
C21
U21
STBZ
GND
THRU
C34
U34
LS138
CS31
C36
U36
08
C66
1000PF
U7
RD
WR
RDB
C12
U12
S163
C20
U20
U22
S32
U29
S169
U33
C33
C23
ACC
S10
U16
S08
U14
SHT.2


DWG NO 5000-052 SH 1 REV C
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
C INC ECO 5000-20-30 K.M.S. 1-21-84
TP2 SYNC
+5V
C22 .1UF
C14 .1UF
C7 .1UF
U22 332
U14 S08
U14 S04
SB
QD1
QD2
TRAN
ALC
C5 .1UF
CLOCK
U31 S151
U35 LS393
C35 .1UF
C31 .1UF
18MHZ
U4 S04
DHT2
U5 Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 DE
D0 D1 D2 D3 D4 D5 D6 D7
LD
G1
U19 S74
TP1
C19 .1UF
U19 PR S04
C18 .1UF
U18 LS555
C63 .1UF
CR12 IN4728
R32 120Ω +5V
R33 270Ω
C64 .1UF
R38 39Ω
Q12 2N4257
Q11 2N4257
Y3 18.432 MHZ
R34 47Ω
C28 .1UF
U28 LS367
U27 S175
C27 .1UF
RDB
R35 680Ω
C65 270PF
R37 150Ω
R36 150Ω
Q13 MPS2369
NOTE: U28 MUST ALWAYS BE INSTALLED.
PRECISION CLOCK INSTALLED
JITTER INSTALLED
PAGE 58
CONTRACT NO
APPROVALS DATE
DRAWN
CHECKED
PHOENIX MICROSYSTEMS
HUNTSVILLE, ALABAMA
TITLE SCHEMATIC
JITTER CLOCK OPTION
5000 MODEM
FINAL MODEM
NEXT ASSY USED ON
APPLICATION
SIZE D FSCM NO DWG NO 5000-052 REV C
SCALE SHEET 1 OF 2


8
7
6
5
D
C
B
A
C55 .1UF
CR8 1N4728
R7 120Ω
+5V
RG 470Ω
R5 1M
C56 .1UF
R8 82Ω
CR13 CR10 MV1405
Q4 2N4257
Q3 2N4257
CR9 CR14 MV1405
Y1 4.6062 MH
R4 1M
R3 47Ω
+5V
C54 .1UF
R2 270Ω
R1 270Ω
R9 150Ω
Q1 2N2369A
J3
FO
GND
THIS SHEET
SH.1
U2 LS374
U10 LS393
U3 LS374
U11 LS393
XFER
SH 13 16MH
U17 LS74
U4 LS74
U26 LS112
C26 .1UF
10HZ
U30 LS290
U25 LS112
U1C CD4040BM
C30 .1UF
C17 .1UF


DWG NO 500-052
REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
+12V
C1 .1UF
+5V
+8V
U1 DAC0830
VCC ILE AGND DGND
DI0 DI1 DI2 DI3 DI4 DI5 DI6 DI7
IOUT1 IOUT2 RFB VREF XFER WR1 WR2 CS1
D0 D1 D2 D3 D4 D5 D6 D7
THIS SH.
SH.1 STB3
U2 741
C8 .01UF
C23 .01UF
C37 .01UF
C57 .01UF
C39 .01UF
C15 .01UF
C38 .01UF
R19 1K
R20 22K
2N3904 Q6
Q7 MPSA55
R16 15K
R17 2K
R18 4.7K
R14 1K
R12 56K
R15 3K
R11 10K
R13 56K
Q5 2N4274-18
J2
C42 100UF 16V
C40 100UF 16V
C43 100UF 16V
C41 100UF 16V
+8V
+5V
-8V
+12V
GND
NC
-5V
R21 3.3Ω
C53 1UF 25V
C49 10UF
C48 10UF
C47 10UF
CR6 1N914
CR5 1N914
CR4 1N914
CR1 1N914
CR3 1N914
CR2 1N914
+40V SOURCE
C50 1UF
C51 1UF
C52 1UF
CR7 1N4754 40V
R23 10K
R22 27K
U24 NE555
C24 .01UF
R24 10Ω
U9 LS74
C45 100UF 16V
C46 100UF 16V
C44 100UF 16V
C59 .1UF
CR11 1N4728
R25 120Ω
R30 82Ω
C60 .1UF
R26 470Ω
Q8 2N4257
Q9 2N4257
Y2 2.4576MHz
CG1 3-35PF
R27 47Ω
R28 470Ω
CG2 .01UF
R31 1K
Q10 2N3904
R29 270Ω
U25 LS112
PAGE 59
DRAWN BY JD WEBB
DATE 9/18/82
SIZE D
FSCM NO. 17981
DWG NO. 5000-052
SCALE
UNIT WT
SHEET 2 OF 2

## 7.0 TROUBLESHOOTING GUIDE

If your unit is not operating properly the following items may be checked prior to returning for factory service.

| SYMPTOM | CORRECTIVE ACTIVE |
|---|---|
| 1. Programs are not retained in memory after power has been off. | A) The internal nicad battery will stay charged for 1-3 months. If a longer time interval has occured, re-program the unit and leave power on for 48 hours continuously.<br><br>B) Replace the internal nicad battery.<br><br>Instructions: Remove 4 screws from bezels. Slide bezels off and remove top cover. The battery is mounted on the front left of the main PW board on battery clips. |
| 2. In ASYNC infinity mode SYNC is not retained in the test set receiving data. | A) Make sure spurious signals are not present on DCE pin 3 of the transmitting test set.<br><br>B) Switch the transmitting test set to SYNC mode (This does not effect data transmission). |
| 3. Test set does not SYNC up (SYNC light out or will not stay solid "on"). | A) Ensure that no poll delay is set.<br><br>B) Ensure that modem is set up to use test clock (pin 24 DCE) or that the "---" bit rate is set for external clock usage.<br><br>C) Ensure RTS light is set on. |

| | | | |
|---|---|---|---|
| | | D) | Ensure proper front panel DCE indicators are set (such as RTS, TD, RD, CTS, and DCD) |
| | | E) | Synchronization is USER mode will occur only in ASYNC 5, 6, 7, or 8 bits |
| 4. | Poll testing is not working | A) | Ensure poll delay time is set longer than the Modem RTS to CTS delay time. |
| | | B) | If block size is set too high the test time to increment one block is significant (block size times poll delay time). |
| 5. | Test set sounds 50% duty cycle audible tone. | A) | Depress error reset to stop. (Static electricity and other high frequency noise sources may trigger this alarm). |
| 6. | All front panel switches do not work | A) | Ensure that one of the front panel switches is not "stuck" in the depressed position due to contamination (usually the display associated with this switch will be cycling through its options). |

If your unit does not exhibit any of the above symptoms and still does not operate properly please call the factory for a return material authorization number, then return your unit for prompt servicing.

## 8.0 OPTIONS

Jitter Measurement: Printed wiring board assembly allows the test set to perform measurement of edge jitter of receive data, in sync and async mode testing. Test set performs 1024 samples of the jitter of receive data and displays the highest peak to peak value over the sample period. The test operator or the controller can request the average value of the measured jitter. Average jitter is displayed when CHAR ERROR switch is depressed. Both the peak to peak and average values are continuously updated as a new sample block analyzed. Jitter accuracy is .5% with a resolution of 1% displayed 0-99%.

Alternate Interfaces: Interface adapters available to convert the TTL output to one of the following:

A) RS449 full balanced

B) MIL-STD 188-114

C) International CCITT V.35

D) Bell Systems 303

# 9.0 RS 232/IEEE -488 REMOTE CONTROL INSTRUCTIONS

## 9.1 INTRODUCTION

The Phoenix Microsystems MTS 5000 is a major advance in automated modem testing. When operated in a stand alone environment it provides the most complete feature set of any bit error analyzer available. Beyond this, the MTS 5000 may be remotely controlled opening a whole new range of test possibilities. An RS 232 control port allows the MTS 5000 to be driven directly from an ASCII terminal, over a modem link (allowing a central test site to control and monitor results at multiple points in a link) or via an RS232 port from a computer. An IEEE-488 interface allows the many features of the MTS 5000 to be integrated into an automated modem test set up driven and monitored completely by a single IEEE-488 controller. In addition to the obvious enhancements provided by the inclusion of remote access via RS232 and IEEE-488 interfaces the operational characteristics of the MTS 5000 have also been expanded in several areas.

- o Event timing in 100 usec intervals
- o Measurement of modem clock frequency in ext sync mode
- o Provision for operation on a user supplied clock
- o Measurement of user clock frequency

The following paragraphs detail the operation of the MTS 5000's remote programming ports and provide programming examples on 3 different controllers.

## 9.2 COMMAND DESCRIPTION

Every test function available on the MTS 5000's front panel may also be accessed via the RS232 and IEEE-488 control ports. The commands and responses of both control ports are identical, except for the selected interface protocol, as discussed in section 10.0. All commands are simple and logical abbreviations forthe functions to be performed. In most cases a command which sets a certain condition can also be used to interrogatethe present setting simply by giving the command with no parameter. Certain test set configurations will inhibit selection of another condition, these are noted in the discussions which follow each command. In the following sections the parameters enclosed in square brackets [] are optional.

## 9.3 PATTERN SELECT

Pattern select determines the transmitted data pattern and the expected receive pattern. Note: selection of any of the poll modes including PING or PONG also forces the test set to SYNC mode and CONTINUOUS character size.

ALT - Selects an alternating mark/space data pattern

MARK - Selects an all mark data pattern

SP - Selects an all space data pattern

PING - Selects the ping poll pattern (Master)

PONG - Selects the pong poll pattern (Slave)

PL 1 to
PL 5 - Selects poll pattern 1 to 5

USER [x] - Either selects a user pattern (x=2 hex digits max) or returns the present user pattern of 2 hex digits

63 - Selects the 63 bit pseudorandom pattern

511 - Selects the 511 bit pseudorandom pattern

2047 - Selects the 2047 bit pseudorandom pattern

PAT - Returns the presently selected data pattern

## 9.4 LINE MONITOR/SELECTS

Fifteen signal lines of the RS232 interface may be monitored. In addition, two of these lines may be actively controlled. In most cases these signals are simply referred to by name in order to request their state.

TD - Transmitted Data. This is an edge sensitive monitor. It samples the transmit data line every 17msec. If a transition positive or negative is detected the TD monitor is set to '1' (on). Detection of no transitions for approximately 1sec returns this monitor to '0' (off).

RD - Received Data. The function of this monitor is the same as for TD described above.

RTS [x] - This command may be used to set Request To Send by following it with either a '1' or '0'. If no parameter is specified the present setting will be returned. This is a level sensitive monitor.

CTS - This command returns the level of Clear To Send.

DSR - This command returns the level of Data Set Ready.

DCD - This command returns the level of Data Carrier Detect.

SDCD - This command returns the level of Secondary Data Carrier Detect.

SCTS - This command returns the level of Seconday Clear To Send.

TC - Transmit Clock. The function of this monitor is the same as for TD described above.

SRD - Secondary Received Data. The function of this monitor is the same as for TD described above.

RC - Receive Clock. The function of this monitor is the same as for TD described above.

DTR - This command returns the level of Data Terminal Ready.

SQ - This command returns the level of Signal Quality.

RI - This command returns the level of Ring Indicator.

TCX - Transmit Clock External. The function of this monitor is the same as for TD described above.

NOTE: All monitor signals are sampled at a 17msec rate. This means that pulses less than 17msec in length may not be detected. To insure a valid reading of any signal it may be necessary to read the signals state multiple times. It should also be noted that the state of a signal may not be validly monitored for up to 17msec after any change.

## 9.5 EVENT TIMER

The MTS 5000's event timer provides a resolution of 100usec from 0 to 99.9msec and 1msec resolution for 100 to 999msec. There are two commands associated with the event timer as follows.

EV [start stop] - This command is used to either select the event start and stop conditions or to read the time associated with an event. If the start/stop parameter field is included it must specify both the start and stop condition seperated by at least 1 space. The possible event conditions are.

| | |
|---|---|
| +RTS | +DTR |
| -RTS | -DTR |
| +CTS | +SQ |
| -CTS | -SQ |
| +DSR | +RI |
| -DSR | -RI |
| +DCD | +RD |
| -DCD | -RD |

Where + indicates a rising edge trigger and - indicates falling edge. Note: rising edge trigger is assumed if + or - is not specified.

If the parameter field is deleted the latest event time is returned. The returned time will be in one of the following formats.

| | |
|---|---|
| - | indicates the selected event has not occured since it was set |
| 0 | indicates the start event was detected but the stop event did not occur less than 1sec there after |
| XX.X | indicates the event has occured and was less than 100msec. The returned result is to 100usec resolution |
| XXX | Indicates the event has occured and was greater than 99.9 msec and less than 1sec. The returned result is to 1msec resolution |

EVENTS - This command returns the present start and stop events. The response is an ASCII string with the start event first, a single space and the stop event.

## 9.6 POLL PATTERN MODIFICATION

The messages sent and received as PL1 to PL5 may be modified by the user in either of two ways. The first method uses the remote access port to download a custom message of up to 100 characters into any or all of the poll patterns. The second method allows the user to customize the transmit and receive eproms within the 5000. Each of these are described below:

TPL X D [DATA] - This command allows for controller modification of the transmit poll message. The 'X' variable specifies the message to modify and is in the range of 1 to 5. 'D' specifies a timeout delay to be applied for retransmision of the data steam if a response is not received. If the time out is set to zero there is no wait for response and the poll delay begins immediatly following the end of the poll transmission. Values from 1 to 0FEH select a response timeout in 10sec increments (10msec to 2.54 sec) during which the transmitter will wait for a response before beginning the poll delay. A value of 0FFH will allow the transmission of a single poll and then waits for RTS to be set TRUE either from the front panel or controller before the next poll is sent. NOTE: For purposes of the timeout a response is detected as: the transition of DCD true and then false again. The data field contains the desired poll message. It may be expressed as any combination of hex and string characters. Hex values are specified as either one or two digits in the range '0-9' or 'A-F'. Strings are delimited by a leading and trailing single quote mark, and may include any character in the ASCII character set from space (2dh) to (7eh) with the exception of its single quote character (2ch). Individual entries in the data field must be seperated by either a space or comma.

When operating in the switched carrier mode it is necessary to enter an extra character in front of the message to be sent. This character is used by the test set but is not transmitted out over the test port. The character to be inserted may be any ASCII character.

FOR EXAMPLE: TPL 1 CB, 'TEST'

Sets 'PL1' to send the message 'TEST' and wait up to 2 sec for a response before entering the poll delay.

RPL X [DATA] - This command allows the controller to modify the message expected by the receiver. The format of each field is identical to the description under 'TPL' above. Note however, the timeout delay field is not present.

An alternate means to modify the 5000's poll messages is to modify the messages in the transmit and receive eproms. This has the advantage of making the modification permanant where as the download patterns are lost when the unit is turned off. Appendix shows the presently stored patterns. To modify any of these patterns requires that first the patterns preceding it must be moved to provide a gap just large enough to hold the new pattern. Then the new pattern must be placed into the gap made. Finally the pointers to the messages in the table 'PNTPAT' or 'RESTBB' must be update to point to each patterns new position.

When operating in the switched carrier mode it is necessary to enter an extra character in front of the message to be sent. This character is used by the test set but is not transmitted out over the test port. The character to be inserted may be any ASCII character.

VER - This command returns the software revision level and date which is installed in the 5000.

NOTE: Units prior to version 1/01. 12/15/82 do not respond to this command.

TIME [X] - This command accesses a real time clock accurate to .1 sec which is maintained within the 5000. Format of the returned time is HH:MM:SS.T. On power up the clock is initialized to 00:00:00.0 and begins counting. The user may program the clock to a given time by entering the hours and minutes. Seconds are setto zero when time is programmed. This feature may be used as a time of day clock which the controller may access or it may be used in a stop watch mode to time events longer than the 1 sec provided by the 5000's event time.

To implement the stop watch event timing the a controller would be programmed to monitor for the start event, using the appropriate 5000 monitor function, and when it occurred to set the time to 0:00:00.0. Then it would poll the 5000 until the stop event was detected and read the duration time to capture the event.

## 9.7 CONFIGURATION

The following commands are used to configure the MTS 5000 to match the modem under test.

MD [x] - This command is used to read or set the mode of operation. If the parameter field is included it is interpreted as follows:

A = async
S = sync

This will set the mode to SYNC or ASYNC in the MTS 5000. Omission of the parameterfieldwill return either A or S indicating async or sync mode respectively as the current mode of operation. Note: selection of sync mode forces character size to continuous.

CS [x] - This command is used to read or set the character size. If the parameter field is included it must be one of the following:

5,6,7,8 or C

Where numerals specify fixed character sizes from 5 to 8 bits and "C" indicates continuous. If no paramter is specified one of the above codes will be returned. Note: selection of a character size other than "C" when in sync mode is an error.

BS [x] - This command is used to read or set the block size. If the parameter field is present it should be a numeric value from 0 to 8. If no parameter is specified the returned value will be a single numeric digit from 0 to 8. Note: selection of a new block size does not cause the present block size to be overridden. The newly set block size does not become effective until the end of the block at the last size setting. This is particularly noticable when going from large to small blocks. To force immediate use of the new block size the "CLR" command should be used following the setting of a new block size.

PR [x] - This command is used to read or set the parity selection. If the parameter field is present it should be one of the following:

E = even
O = odd
N = none

If no parameter is set the present setting will be returned.

SB [x] - This command is used to read or set the number of stop bits. If the parameter field is present it should be 1, 1.5 or 2 to select one, one and a half or two stopbits respectively. If the parameter field is omitted one of the above selections will be returned to show the present setting.

SY [x] - Sync control. The sync control command is used to monitor the present sync state and to break sync or reset to recovered sync flag. If no parameter is supplied the MTS 5000 will return one of the following responses:

S = in sync
R = recovered sync
N = no sync

By suppling a parameter the sync command can be used to perform the following functions:

B = break sync, forces the MTS 5000 to attempt to reacquire sync
R = reset recovered sync flag, changes the response from R to S

Note: changing any of the following conditions may cause the MTS 5000 to enter a false sync condition

| | |
|---|---|
| Parity | Block size |
| Stop bits | Character size |
| Mode | Pattern |

To assure valid sync following change of any of these parameters the MTS 5000 should be forced to break and reacquire sync.

XE [x] - Transmit Error. The parameter field, when included, should contain either a '1' to enable or a '0' to disable error transmission. When enabled, errorsare transmitted once per pattern cycle. If used with no parameter. A single character response will be returned indicating status.

ST [x] - Self Test. This command is used to select or read the state of the selftest function. The parameter field, when included, should contain either a '1' to enable or a '0' to disable selftest. If the parameter field is omitted a single character response will be returned to show state.

BR [x] - Bit Rate. The bit rate command is used to select or read the present bit rate. If the parameter field is included it must be selected from the following list of standard rates:

| | |
|---|---|
| 75 | 2000 |
| 110 | 2400 |
| 134.5 | 4800 |
| 150 | 7200 |
| 300 | 9600 |
| 600 | 14400 |
| 1200 | 16000 |
| 1800 | 19200 |

If the selected rate is not in this list an error response is generated. If no parameter is specified the preset bit rate is returned. The returned rate will be in one of the following formats:

x.xS the bit rate is generated by the MTS 5000 and is exactly one of the standard rates listed above

x.xO the bit rate is generated by the MTS 5000 and is at an "off" standard rate

-X the MTS 5000 is set to operate from an external (modem) clock but nothing is measured

x.xX the MTS 5000 is set to operate from an external (modem) clock of the returned rate

-U the MTS 5000 is set to operate from a user supplied clock but nothing is measured

x.xU the MTS 5000 is set to operate from a user supplied clock of the returned rate

Note: selection of external, user or changing modes will cause the MTS 5000 to restart measurment of clock rate. It will take from 1 to 2 seconds to obtain the first reading.

BRU - Bit Rate Up. This command causes the MTS 5000's bit rate clock to be incremented up one step.

BRD - Bit Rate Down. This command causes the MTS 5000's bit rate clock to be incremented down one step.

BRC x - Bit Rate Count. This command allows direct setting of the Mts 5000's internal bit rate counter. The parameter field is not optional and is the decimal devisor of the system clock required to obtain the selected frequency. The count must be within the range from 224 to 65511. The count to obtain any desired frequency is determined by the following:

count = 4.608x10©6 / frequency

EXT - The external clock command causes the MTS 5000 to use the modem's clocks in sync mode. If the mode is set to async when this command is given an error is generated.

BI - This command returns the present bias of the received data.

EUSR - This command enables use of user supplied clock if available.

DUSR - This command disables use of the user supplied clock.

PD [x] - This command is used to set or read the poll delay. If the parameter is included it must be in the range from 0 to 99 to set delay. If no parameter is input the returned delay is that reading currently displayed by the MTS 5000 and is a value between 0 and .99 seconds.

## 9.8 TESTING

The following commands control start and stop of a test as well as monitoring of the test results.

RUN [x] - This command is used to start a bit error test or to monitor the present run state. If the parameter field is included it should be either a 'C' for continuous or 'S' for single run. Execution of the run command with no parameter will return either an 'R' to indicate running or 'S' to indicate stopped.

STOP - This command stops either a continuous or single run.

CLR - This command clears the blocks analyzed, error one and error two displays to zero.

BA - This command returns the number of blocks analyzed. It is a number from 0 to 999. If the number of blocks analyzed has exceeded 999 the total number is evaluated modulo 1000 and a trailing "0" is appended to signal the overflow.

ERR1 - This command returns the same data as is normally displayed in the bit error display. Refer to the manual (Section 2.11) for further clarification of the meaning of the bit error display in various modes and patterns. Overflow of this display is handled in the same manner as the blocks analyzed display described above.

ERR2 - This command returns the same data as is normally displayed in the character error display. Refer to the manual (Section 2.12) for further clarification of the meaning of the character error display in various modes and patterns. Overflow of this display is handled in the same manner as the blocks analyzed display described above.

BLKE - Units with revision numbers of 3.60 and above measure block errors. The resulting data is available on the remote ports using the command BLKE.

JITTER MEASUREMENT (OPTION)

JPP - This command requests the greatest peak to value of data jitter measured. Jitter is isochronous distortion as defined in EIA RS 334-A.

JAVG - This command requests the value of the average data jitter.

EHOLD - This command resets and enables a continuous hold of the greatest peak to peak data jitter value for any length of test desired. Accumulating counters can be reset to zero with "EHOLD" command.

DHOLD - Command resets and disables the peak hold. Operation reverts to the greatest peak to peak data jitter in a 1024 bit sample, updated every 1024 bits. Reset to zero with DHOLD command.

NOTE: For bit rates below 300 BPS the sample size is 256.

Constant Carrier polling can be enabled for transmitted data, received data, or both. The new commands for this feature are:

(A) CCTX -Constant Carrier Transmit

This command causes the MTS 5000 to hold the RTS output continuously TRUE. In the synchronous mode, sync characters are transmitted between polls. This function operates in poll modes only and will return an error message if not in poll mode.

(B) SCTX -Switched Carrier Transmit

This command causes the MTS 5000 to switch the RTS output to TRUE when ready to transmit a poll, and then set it to FALSE. Sync characters are not transmitted between polls. This is the normal, default mode.

(C) CCRX- Constant Carrier Receive

This command enables the MTS 5000 to receive polls with no transition of the DCD input signal between polls. The start of a poll is detected by matching the first character of the poll to incoming data.

(D) SCRX -Switched Carrier Receive

This command sets the MTS 5000 to receive polls with transitions of the DCD inputs between polls. The start of the poll is detected by the transition of DCD from FALSE to TRUE. This is the normal, default mode.

## 9.9 MISC.

The following commands perform various control functions governing operation of the MTS 5000 itself.

IL [x] - Select or read the interface level setting. If included the interface level parameter is either 'E' for EIA or 'T' to select TTL. With no parameter specified the present setting is returned as a single character either 'E' or 'T'.

DKEY - This command disables the key switches on the MTS 5000's front panel.

EKEY - This command enables the key switches on the MTS 5000's front panel. Note: the key switches are enabled on power up.

DBELL - This command disables the MTS 5000's end-of-test and glitch detect bell.

EBELL - This command enables the MTS 5000's end-of-test and glitch detect bell. Note: the bell is enabled on power up.

STO x - This command stores the present setting of all front panel switches into the program selected by x. x must be in the range from 0 to 9.

RCL x - This command reconfigures the MTS 5000 to the conditions stored in program x. x must be in the range from 0 to 9.

## 9.10 COMMUNICATION PORT SET UP

The MTS 5000's remote programming ports use a soft key approach to enable them to be configured to the users application. To accomplish this set up, a new entry has been added to the program number display on the MTS 5000's front panel. Rolling the program number display to 'C' (communication) with the 'SEL' switch and then pressing 'RECALL' will display the present configuration. Once 'RECALL' has been pushed much of the display will go blank. The remaining displays indicate the present mode (RS232 or IEEE-488) the selected protocol (ACK or CRLF) the IEEE-488 address, character size, bit rate, stop and parity bits. The following subparagraphs provide details for these displays.

PORT SELECT - The pattern display shows which of the two programming ports is active. Successive presses of the pattern set switch toggles this display between'232' and'488' selecting RS232 and IEEE-488 ports respectivly.

PROTOCOL - There are two communication protocols to select from. These are discussed in detail in the protocol section. The presently selected protocol is displayed in the event stop window and may be selected to either 'ACK' or 'CRLF' by the event stop set switch.

IEEE-488 ADDRESS The MTS 5000 implements a single primary address for both talk and listen function on the IEEE-488 bus. There are 31 possible addresses from 0 to 30. The present address is displayed in the "poll dly" window. To select a new address simply hold the "poll dly" set switch until the desired address is shown.

CHARACTER SIZE The RS232 port may be set to use either a 7 or 8 bit character length using the character size display and set switch.

BIT RATE - The bit rate in the RS232 mode is displayed and set in the bit rate window. Standard rates are provided at:

| | |
|---|---|
| 50 | 1800 |
| 75 | 2000 |
| 110 | 2400 |
| 150 | 4800 |
| 300 | 7200 |
| 600 | 9600 |
| 1200 | |

STOP BITS - The stop bit display selects the number of stop bits as 1, 1.5 or 2.

PARITY - The parity display selects parity as odd, even or none.

As a convenience in setting up communication between the MTS 5000 and the external communication device the Event Start display shows, in a scrolling display, all characters received at the selected port. Characters from 21H to 5EH are displayed with characters outside this range showing as spaces. In addition the MTS 5000 echos each received character so that a simple test at the external device can assure proper two way communication.

Once the proper set up has been selected the MTS 5000 is returned to normal operation by pressing the 'MEM' switch.

## 9.11 PROTOCOL

The MTS 5000 operates using the 7 bit ASCII code. Commands to the MTS 5000 consist of strings of ASCII characters in the range from space (20H) to DEL (7FH) terminated by a carriage return (0DH). Characters less than 20H are ignored except for back space (08H) which functions as a delete.

The response from the MTS 5000 can take on one of several formats depending upon the selected protocol.

## 9.12 IEEE-488/CRLF

In this mode, commands which result in the MTS 5000 sending a response expect it to be formatted as follows:

```
char 1
  "
  "
char x
  CR
  LF        EOI
```

The controlling device should be set to terminate its input on either the line feed character code or the assertion of the EOI line.

## 9.13 IEEE-488/ACK

Unlike the previous mode, in which the controller operated in an open loop manner, the ack protocol provides a response to each command regardless of whether the command returns data. If the command is understood an ACK (06H) character is returned. If an error is encountered in interpreting the command, NAK (15H) is returned. If additional data is to be returned it follows the first ACK and is terminated by a second ACK. The three possible responses are shown below.

| | | |
|---|---|---|
| (error) | NAK | EOI |
| (good, no data) | ACK | EOI |
| (good, data) | ACK | |
| | char 1 | |
| | " | |
| | " | |
| | char x | |
| | ACK | EOI |

Note: in all cases the EOI line indicates end of response.

## 9.14 RS232/ACK

Operation of the RS232/ACK protocol is identical to the IEEE-488 protocol with the exception that there is no EOI line. It is the controllers responsiblity to know if additional data is expected following the first ACK. In practice this knowledge comes naturally with the program organization.

This protocol uses a half duplex data transfer structure on the RS232 port. The MTS 5000 controls data flow to itself through the DTR line and sends data via the RTS/CTS handshake.

### 9.15 RS232/CRLF

This mode is intended primarily for use with a directly connected terminal. It operates full duplex and echos every character received. In this mode DEL and Back Space send a character sequence, the response to which will delete the last character. A control-x will cause the MTS 5000 to ignore the present line. If an error is encountered in interpreting the input line it is reprinted to the error point and a '?' is inserted. The response to commands is shown on the line following the command.

## 9.16 PROGRAMMING EXAMPLES

Programming examples are provided on the following pages for a FLUKE 1720A, and HP 85 computers.

## 9.17 FLUKE 1720A CONTROLLER

Example 1 is for a FLUKE 1720A operating with the 488/ACK protocol. Two points to note particularly are in lines 40 and 60. Line 40 causes the 1720A to terminate input strings from the MTS 5000 on the EOI line. In line 60 a Device Clear command is sent to the MTS 5000. There may be a delay of up to 1 second in processing the Device Clear command which is provided for the 'wait 1000' instruction.

Detailed listing on following page.

```
5 PRINT CHR$(27);"[2J";CPOS(4,0); ! CLEAR SCREEN AND POSTION CURSOR
10 PRINT "MTS 5000 --- 1720A MONITOR MODE ROUTINE"\ PRINT\ PRINT ! SIGN O
11 PRINT "NOTE: THIS ROUTINE REQUIRES THE MTS 5000 TO BE SET"
12 PRINT "      TO THE 488/ACK PROTOCOL."
30 PRINT "ENTER DEVICE NUMBER";\INPUT D% ! SELECT DEVICE NUMBER
40 TERM ! SET FOR INPUT TERMINATION ON EOI
50 INIT PORT 0 ! IFC ON IEEE-488 BUS
60 CLEAR @ D% \ WAIT 1000 ! GIVE IT A SECOND TO TAKE EFFECT
70 TIMEOUT 500 ! GIVE 'MTS 5000' .5SEC TO RESPOND
80 PRINT "(PMI)";\INPUT A$ ! PROMPT FOR COMMAND INPUT
90 IF LEN(A$)=0 THEN 80 ! IGNORE NULL LINES
100 PRINT @ D%,A$ ! SEND COMMAND TO MTS 5000
110 INPUT @ D%,R$ ! GET RESPONSE FROM MTS 5000
120 IF R$=CHR$(21) THEN PRINT A$;"?"\GOTO 80 ! NAK INDICATES NOT UNDERSTO
130 IF LEN (R$)=1 THEN GOTO 80 ! IF ONLY 1 CHAR. MUST BE ACK
140 R$=MID(R$,2,LEN(R$)-2) ! STRIP OFF LEADING AND TRAILLING ACK'S
150 PRINT A$;" = ";R$ ! SHOW THE RESPONSE
160 GOTO 80 ! PROMPT AGAIN TO START IT OVER
```

```
5 TERM CHR$(10)
10 OPEN "KB1:" AS NEW FILE 5%
15 PRINT CHR$(27);"[2J";CPOS(4,0);
20 PRINT "MTS 5000 --- 1720A CONTROL SIGNAL RESPONSE TEST"\PRINT\PRINT
25 PRINT "NOTE: THIS ROUTINE REQUIRES THE MTS 5000 TO BE SET"
30 PRINT "      TO THE 488/CRLF PROTOCOL."
35 PRINT "SELECT DEVICE #";\ INPUT D%
40 F$="###.#"
45 T1$="RESPONSE 'RTS' =) 'CTS' (50 SAMPLES)     "
50 T2$="RESPONSE '-RTS' =) '-CTS' (50 SAMPLES)   "
55 T3$="*****  NO 'CTS' ACTIVITY  *****"
60 T4$="RESPONSE 'RTS' =) 'DCD' (50 SAMPLES)     "
65 T5$="RESPONSE '-RTS' =) '-DCD' (50 SAMPLES)   "
70 T6$="*****  NO 'DCD' ACTIVITY  *****"
75 T7$="RESPONSE 'DCD' =) 'CTS' (50 SAMPLES)     "
80 T8$="RESPONSE '-CTS' =) '-DCD' (50 SAMPLES)   "
85 T9$="***** 'DCD' OR 'CTS' INACTIVE *****"
200 INIT PORT 0
201 CLEAR @ D%\ WAIT 1000
202 LOCAL @ D%
205 PRINT #5%, "TEST START ";DATE$; \GOSUB 9000
210 E=0
220 GOSUB 1000
230 GOSUB 2000
240 GOSUB 3000
250 PRINT #5%, "END OF TEST ";DATE$;\ GOSUB 9000
260 PRINT "TEST AGAIN (Y/N)";
270 INPUT A$\ IF LEFT("YES",LEN(A$))=A$ THEN 200 ELSE CLOSE 5%\END
1000 X$="RTS 0"\ GOSUB 8000
1010 GOSUB 7200
1020 X$="EV RTS CTS"\ GOSUB 8000\ X$="RTS 1"\ GOSUB 8000
1030 GOSUB 7000
1040 IF RIGHT(A$,1)="0" THEN 1160 ELSE GOSUB 6000
1050 X$="EV -RTS -CTS"\ GOSUB 8000\ X$="RTS 0"\ GOSUB 8000
1060 GOSUB 7000
1070 IF RIGHT(A$,1)="0" THEN 1160 ELSE GOSUB 6100
1080 IF Z=50 THEN 1090 ELSE Z=Z+1\ GOTO 1020
1090 M3=M3/50\ N3=N3/50
1110 PRINT #5%, T1$;
1120 PRINT #5%, USING F$,"MIN:";M1;"   MAX:";M2;"   AVG:";M3
1130 GOSUB 7300
1140 PRINT #5%, T2$;
1150 PRINT #5%, USING F$,"MIN:";N1;"   MAX:";N2;"   AVG:";N3\ RETURN
1160 E=E+1
1170 PRINT #5%, T3$\ GOSUB 7300\ RETURN
2000 X$="RTS 0"\ GOSUB 8000
2010 GOSUB 7200
2020 X$="EV RTS DCD"\ GOSUB 8000\ X$="RTS 1"\ GOSUB 8000
2030 GOSUB 7000
2040 IF RIGHT(A$,LEN(A$)-1)="0" THEN 2160 ELSE GOSUB 6000
2050 X$="EV -RTS -DCD"\ GOSUB 8000\ X$="RTS 0"\ GOSUB 8000
2060 GOSUB 7000
```

```
2070 IF RIGHT(A$,LEN(A$)-1)="0" THEN 2160 ELSE GOSUB 6100
2080 IF Z=50 THEN 2090 ELSE Z=Z+1\ GOTO 2020
2090 M3=M3/50\ N3=N3/50
2110 PRINT #5%, T4$;
2120 PRINT #5%, USING F$,"MIN:";M1;"   MAX:";M2;"   AVG:";M3
2130 GOSUB 7300
2140 PRINT #5%, T5$;
2150 PRINT #5%, USING F$,"MIN:";N1;"   MAX:";N2;"   AVG:";N3\ RETURN
2160 E=E+2
2170 PRINT #5%, T6$\RETURN
3000 X$="RTS 0"\ GOSUB 8000\ IF E<>0 THEN 3160
3010 GOSUB 7200
3020 X$="EV DCD CTS"\ GOSUB 8000\ X$="RTS 1"\ GOSUB 8000
3030 GOSUB 7000
3040 IF RIGHT(A$,LEN(A$)-1)="0" THEN 3160 ELSE GOSUB 6000
3050 X$="EV -CTS -DCD"\ GOSUB 8000\ X$="RTS 0"\ GOSUB 8000
3060 GOSUB 7000
3070 IF RIGHT(A$,LEN(A$)-1)="0" THEN 3160 ELSE GOSUB 6100
3080 IF Z=50 THEN 3090 ELSE Z=Z+1\ GOTO 3020
3090 M3=M3/50\ N3=N3/50
3110 PRINT #5%, T7$;
3120 PRINT #5%, USING F$,"MIN:";M1;"   MAX:";M2;"   AVG:";M3
3130 GOSUB 7300
3140 PRINT #5%, T8$;
3150 PRINT #5%, USING F$,"MIN:";N1;"   MAX:";N2;"   AVG:";N3\RETURN
3160 PRINT #5%, T9$\ GOSUB 7300\ RETURN
6000 V=VAL(A$)
6010 IF M1>V THEN M1=V\ GOTO 6030
6020 IF M2<V THEN M2=V
6030 M3=M3+V\ RETURN
6100 V=VAL(A$)
6110 IF N1>V THEN N1=V\ GOTO 6130
6120 IF N2<V THEN N2=V
6130 N3=N3+V\RETURN
7200 X$="EV"
7210 GOSUB 8000\ GOSUB 8100
7230 IF LEFT(A$,1)="-" THEN 7000
7240 RETURN
7300 IF RIGHT(A$,1)="I" THEN A$=LEFT(A$,LEN(A$)-1)
7320 Z=1\ M1=9999\ M2=0\ M3=0\ N1=M1\ N2=M2\ N3=M3\ RETURN
7330 RETURN
8000 PRINT @ D%, X$\ RETURN
8100 INPUT @ D%, A$
8110 RETURN
9000 N=TIME
9005 A$=" AM"
9010 N=N/1000 ! CONVERT TO SECONDS
9020 N1=INT(N/3600)
9030 N2=N-(N1*3600)\ N2=INT(N2/60)
9040 N3=N-(N1*3600)-(N2*60)
9050 IF N1>12 THEN N1=N1-12\ A$=" PM"
9060 PRINT #5%, USING "##","  ";N1;":";N2;":";N3;A$
9070 RETURN
```

Example 2 is for a FLUKE 1720A operating with the 488/CRLF protocol. The primary difference between use of the CRLF and ACK protocols can be seen in line 5. Here the 'term' instruction is used to force termination of input from the MTS 5000 on line feed characters.

The following is a sample output from this routine.

```
TEST START 24-Oct-82  3:58:30 PM
RESPONSE 'RTS' =) 'CTS' (50 SAMPLES)     MIN: 10.8   MAX: 10.8   AVG: 10.8
RESPONSE '-RTS' =) '-CTS' (50 SAMPLES)   MIN:  0.6   MAX:  0.6   AVG:  0.6
RESPONSE 'RTS' =) 'DCD' (50 SAMPLES)     MIN:  8.1   MAX:  8.9   AVG:  8.6
RESPONSE '-RTS' =) '-DCD' (50 SAMPLES)   MIN:  9.1   MAX: 10.6   AVG:  9.6
RESPONSE 'DCD' =) 'CTS' (50 SAMPLES)     MIN:  1.9   MAX:  2.7   AVG:  2.2
RESPONSE '-CTS' =) '-DCD' (50 SAMPLES)   MIN:  8.5   MAX:  9.3   AVG:  8.9
END OF TEST 24-Oct-82  3:59:20 PM
```

## 9.18 HP 85 CONTROLLER

Examples 3 and 4 are both for and HP 85 controller. They both use the 488/ACK protocol. Of particular importance in these examples the use of the 'transfer' instruction (line 9020). Notice its use of EOI to terminate input to X$.

Example 3 provides a simple monitoring function recording the min, max and delta of the external clock and bias while also monitoring the bit and character error rates.

Example 4 provides an interactive monitor mode allowing commands to be entered from the keyboard.

```
  5 CLEAR
 10 DIM X$[80],S$[80]
 20 B1=100 @ B2=0
 30 X1=50000 @ X2=0
100 S$="MD S" @ GOSUB 9000
110 S$="63" @ GOSUB 9000
120 S$="BS 2" @ GOSUB 9000
130 S$="RTS 1" @ GOSUB 9000
140 S$="EXT" @ GOSUB 9000
145 S$="SY B" @ GOSUB 9000
146 S$="XE 0" @ GOSUB 9000
147 S$="ST 0" @ GOSUB 9000
148 S$="SY" @ GOSUB 9000 @ IF X$
    <>"S" THEN 148
150 S$="CLR" @ GOSUB 9000
170 S$="SY R" @ GOSUB 9000
180 S$="RUN C" @ GOSUB 9000
200 FOR N=1 TO 1000 @ NEXT N
1000 S$="ER" @ GOSUB 9000 @ R$=X
     $
1010 S$="BI" @ GOSUB 9000 @ B$=X
     $
1020 S$="ER1" @ GOSUB 9000 @ E$=
     X$
1030 S$="ER2" @ GOSUB 9000 @ C$=
     X$
1040 S$="BA" @ GOSUB 9000 @ A$=X
     $
1050 S$="SY" @ GOSUB 9000 @ S$=X
     $
2000 IF R$[LEN(R$),LEN(R$)]<>"X"
      THEN 2100
2005 IF R$[1,1]="-" THEN 2100
2010 X=VAL(R$[1,LEN(R$)-1])
2020 X1=MIN(X1,X)
2030 X2=MAX(X2,X)
2100 B=VAL(B$)
2110 B1=MIN(B1,B)
2120 B2=MAX(B2,B)
2500 CLEAR
2504 DISP "********** BIT RATE *
     **********"
2505 DISP "MIN:";X1;"MAX:";X2;"D
     ELTA:";X2-X1
2510 DISP @ DISP "********** BIA
     S **************"
2520 DISP "MIN:";B1;"MAX:";B2;"D
     ELTA:";B2-B1
2530 DISP @ DISP "********** ERRO
     RS **************"
2540 DISP "BIT ERRORS: ";E$
2550 T$="" @ FOR N=1 TO LEN(C$)
2560 IF C$[N,N]<>"." THEN T$=T$&
     C$[N,N]
2570 NEXT N
2580 DISP "CHAR ERRORS: ";T$
2590 DISP "BLOCKS ANALYZED: ";A$
2600 DISP @ DISP "************ ST
     ATUS ************"
2610 IF S$="S" THEN DISP "IN SYN
     C" ELSE DISP "NO SYNC"
2620 IF R$[1,1]="-" THEN DISP "N
     O CLOCK" ELSE DISP "
          "
3000 FOR N=1 TO 400 @ NEXT N @ G
     OTO 1000
9000 OUTPUT 700 ;S$
9010 IOBUFFER X$
9020 TRANSFER 700 TO X$ FHS , EO
     I
9030 IF NUM(X$)<>6 THEN 9000
9040 IF LEN(X$)=1 THEN RETURN
9050 X$=X$[2,LEN(X$)-1]
9060 RETURN
```

```
  5 CLEAR
 10 DIM X$[80],S$[80]
100 DISP "<PMI>";
110 INPUT S$
120 GOSUB 9000
130 IF NUM(X$[1,1])=21 THEN DISP
     S$;"?" @ GOTO 100
140 IF LEN(X$)=1 AND NUM(X$)=6 T
    HEN GOTO 100 ELSE DISP S$;"=
    ";X$
150 GOTO 100
9000 OUTPUT 700 ;S$
9010 IOBUFFER X$
9020 TRANSFER 700 TO X$ FHS , EO
     I
9040 IF LEN(X$)=1 THEN RETURN
9050 X$=X$[2,LEN(X$)-1]
9060 RETURN
```

## 9.19 OSBORNE CONTROLLER

Examples 5 and 6 run on an Osborne computer using CP/M and Microsoft Basic. In this application two machine language routines, one for input the other for output, are poked into memory. The hex machine codes for these routines are in lines 9000 and subsequently in each listing. The subroutines at 8000 and 8100 are used to output X$ to the MTS 5000 and receive A$. Both examples use the 488/ACK protocol.

```
10 CLEAR,45000!
17 RESTORE
20 MEM=50000!:LENGTH=99
21 PRINT CHR$(26);
22 INPUT "SELECT DEVICE NUMBER (0 TO 30): ",A1: IF A1<0 OR A1>30 THEN 22
23 COUT=MEM:CIN=MEM+43
26 MOUT=&HCEFF:MIN=&HCEFE:MSTAT=&HCEFD:ADDR=&HCEFC:STATE=&HCEFB
27 POKE STATE,0: POKE ADDR,A1
30 FOR X=0 TO LENGTH-1
40 READ A:POKE MEM+X,A:NEXT X
50 REM ************************************
60 PRINT CHR$(26)
61 GOSUB 6000
62 GOSUB 1000
70 GOSUB 5000:GOSUB 4000: GOSUB 100: GOSUB 4000:GOSUB 5010:GOSUB 4000
72 GOSUB 5100
73 GOSUB 2000:GOSUB 2100
80 GOSUB 3000:GOSUB 3110 :GOTO 70
100 GOSUB 7400:GOSUB 4000: GOSUB 7200:GOSUB 4000: GOSUB 7600:GOSUB 4000: GOSUB 7800: GOSUB 4000: GOSUB 7000:GOSUB 4000: RETUR
1000 X$="PL1" : GOSUB 8000
1010 X$="PD 1":GOSUB 8000
1020 X$="XE 0":GOSUB 8000
1025 X$="EXT": GOSUB 8000
1030 X$="ST 0": GOSUB 8000
1040 X$="MD S": GOSUB 8000
1050 X$="BS 2":GOSUB 8000
1060 X$="RTS 1": GOSUB 8000
1070 X$="DTR 1": GOSUB 8000
1080 X$="UKEY":GOSUB 8000
1085 X$="SY R": GOSUB 8000
1086 X$="RUN C":GOSUB 8000
1090 RETURN
2000 PRINT CHR$(27);"=";CHR$(32+12);CHR$(32+35);
2010 X$="RUN": GOSUB 8000: GOSUB 8100: IF A$="R" THEN PRINT "RUNNING":RETURN: ELSE PRINT "STOPPED": RETURN
2100 PRINT CHR$(27);"=";CHR$(32+13);CHR$(32+35);
2110 X$="SY": GOSUB 8000: GOSUB 8100
2120 IF A$="S" THEN PRINT "SYNC            "
2130 IF A$="R" THEN PRINT "RECOVERED       "
2140 IF A$="N" THEN PRINT "NO SYNC       "
2150 RETURN
3000 PRINT CHR$(27);"=";CHR$(16+32);CHR$(32+1);:X$="TD":GOSUB 8000: GOSUB 8100:PRINT A$;
3010 X$="RD":GOSUB 8000: GOSUB 8100: PRINT "    ";A$;
3020 X$="RTS":GOSUB 8000:GOSUB 8100: PRINT "    ";A$;
3040 X$="DSR":GOSUB 8000:GOSUB 8100: PRINT "    ";A$;
3050 X$="DCD":GOSUB 8000:GOSUB 8100: PRINT "    ";A$
3060 X$="TC":GOSUB 8000:GOSUB 8100: PRINT " ";A$;
3070 X$="RC":GOSUB 8000:GOSUB 8100: PRINT "    ";A$;
3080 X$="DTR":GOSUB 8000: GOSUB 8100: PRINT "    ";A$;
3090 X$="SQ" :GOSUB 8000:GOSUB 8100: PRINT "    ";A$;
3100 X$="TCX":GOSUB 8000:GOSUB 8100: PRINT "    ";A$
3110 RETURN
4000 K$=INKEY$: IF LEN(K$)=0 THEN RETURN
4010 IF K$="C" THEN X$="CLR": GOSUB 8000: RETURN
4020 IF K$="R" THEN X$="RUN C": GOSUB 8000: RETURN
4030 IF K$="S" THEN X$="RUN S": GOSUB 8000: RETURN
```

```
4040 IF K$="Q" THEN X$="STOP": GOSUB 8000: RETURN
4050 IF K$="X" THEN X$="XE": GOSUB 8000: GOSUB 8100: IF A$="0" THEN X$="XE 1" : GOSUB 8000: RETURN:ELSE X$="XE 0": GOSUB 8000: R
N
4060 IF K$="P" THEN 4200
4100 RETURN
4200 GOSUB 4250
4210 INPUT "ENTER POLL DELAY (0 TO 99): ";X
4220 IF X<0 OR X>99 THEN 4200
4230 X$="PD "+STR$(X):GOSUB 8000:GOSUB 4250: RETURN
4240 PRINT CHR$(27);"=";CHR$(22+32);CHR$(32);: RETURN
4250 GOSUB 4240:PRINT "                                                    ":GOSUB 4240:RETURN
5000 X$="EV RTS CTS": GOSUB 8000: RETURN
5010 PRINT CHR$(27);"=";CHR$(5+32);CHR$(25+32);
5015 T=5
5020 X$="EV": GOSUB 8000: GOSUB 8100
5030 IF LEFT$(A$,1)<>"-" THEN 5060
5040 T=T-1: IF T=0 THEN 5060 ELSE 5020
5060 IF LEFT$(A$,1)="-" THEN PRINT "INACTIVE":RETURN
5070 IF RIGHT$(A$,1)="I" THEN A$=LEFT$(A$,LEN(A$)-1)
5080 PRINT A$;"     ":RETURN
5100 X$="EV DCD RD": GOSUB 8000: RETURN
5110 PRINT CHR$(27);"=";CHR$(5+32);CHR$(40+32);
5120 GOTO 5015
6000 A$=CHR$(27)+CHR$(41):X$=CHR$(27)+CHR$(40)
6010 PRINT CHR$(30);"                P O L L    T E S T"
6020 PRINT A$;"BIT ERR";X$;"   ";A$;"CHR ERR";X$;"   ";A$;"BLOCKS "X$;"   ";A$;"BIAS";X$
6030 PRINT CHR$(27);"=";CHR$(4+32);CHR$(32);
6040 PRINT A$;"-----BIT RATE-----     RTS -> CTS     DCD --> RD";X$
6045 PRINT CHR$(27);"=";CHR$(19+32);CHR$(32);"=========================================================="
6050 PRINT CHR$(27);"=";CHR$(20+32);CHR$(32);
6060 PRINT "C";A$;"=CLEAR";X$,"   R";A$;"=RUN CONT"X$;"    S";A$;"=RUN SINGLE";X$;"   Q";A$;"=QUIT RUN";X$
6070 PRINT "X";A$;"=XMIT ERR";X$,"B";A$;"=BLOCK SIZE";X$;"  P";A$;"=POLL DELAY";X$
6080 PRINT CHR$(27);"=";CHR$(15+32);CHR$(32);
6090 PRINT A$;"TD   RD   RTS  DSR  DCD";X$:PRINT:PRINT
6100 PRINT A$;"TC   RC   DTR  SQ   TCX";X$
6110 PRINT CHR$(27);"=";CHR$(32+8);CHR$(32+30);"=========================="
6115 PRINT CHR$(27);"=";CHR$(32+10);CHR$(32+35);"TEST STATUS"
6120 FOR T=1 TO 10: PRINT CHR$(27);"=";CHR$(32+8+T);CHR$(32+30);"I":NEXT T
6130 PRINT CHR$(27);"=";CHR$(8+32);CHR$(32);
6140 PRINT "PHOENIX MICROSYSTEMS, INC."
6150 PRINT "PO BOX 4206"
6160 PRINT "HUNTSVILLE, AL 35802"
6170 PRINT "TEL: 205-536 2826"
6180 PRINT "CONTACT: 'SCOOTER' MAYO"
6190 RETURN
7000 X$="BR":GOSUB 8000:GOSUB 8100
7010 PRINT CHR$(27);"=";CHR$(5+32);CHR$(32);
7020 IF LEFT$(A$,1)="-" THEN PRINT "NO CLOCK           ":RETURN
7030 IF RIGHT$(A$,1)="X" THEN PRINT LEFT$(A$,LEN(A$)-1);" MEASURED   ":RETURN
7040 IF RIGHT$(A$,1)="S" THEN PRINT LEFT$(A$,LEN(A$)-1);" INT STD    ":RETURN
7050 PRINT LEFT$(A$,LEN(A$)-1);" INT NON-STD":RETURN
7200 X$="ER1" : GOSUB 8000: GOSUB 8100
7210 PRINT CHR$(27);"=";CHR$(2+32);CHR$(32);
7220 IF RIGHT$(A$,1)="0" THEN 7240
7230 PRINT USING "###    ";VAL(A$):RETURN
7240 PRINT USING "### OVR";VAL(A$):RETURN
```

```
7400 X$="ER2": GOSUB 8000: GOSUB 8100
7410 PRINT CHR$(27);"=";CHR$(2+32);CHR$(10+32);
7415 X$=""
7420 FOR T=1 TO LEN(A$)
7430 IF MID$(A$,T,1)<>"." THEN X$=X$+MID$(A$,T,1)
7440 NEXT T: A$=X$: GOTO 7220
7600 X$="BA" : GOSUB 8000: GOSUB 8100
7610 PRINT CHR$(27);"=";CHR$(2+32);CHR$(20+32);
7620 GOTO 7220
7800 X$="BI": GOSUB 8000: GOSUB 8100
7810 PRINT CHR$(27);"=";CHR$(2+32);CHR$(31+32);
7820 PRINT USING "$$";VAL(A$):RETURN
8000 X$=X$+CHR$(13)
8010 FOR N=1 TO LEN(X$)
8020 POKE MOUT,ASC(MID$(X$,N,1)):CALL COUT
8030 NEXT N
8040 CALL CIN
8050 IF PEEK(MIN)<>6 THEN 8010 ELSE RETURN
8100 A$=""
8120 GOSUB 8140
8130 IF ASC(RIGHT$(A$,1))<>6 THEN 8120
8135 A$=LEFT$(A$,LEN(A$)-1):RETURN
8140 CALL CIN
8150 A$=A$+CHR$(PEEK(MIN)):RETURN
9000 REM ******* DATA FOR IEEE-488 OUTPUT ROUTINE *****
9010 DATA &H3A,&HFB,&HCE,&HFE,&H01,&H28,&H1B,&H0E,&H5F,&HCD,&H4B,&HE5
9020 DATA &HE6,&H80,&H20,&HF9,&H3A,&HFC,&HCE,&HC6,&H20,&H4F,&HCD,&H4B,&HE5
9030 DATA &HE6,&H80,&H20,&HF9,&H3E,&H01,&H32,&HFB,&HCE,&H3A,&HFF,&HCE
9032 DATA &H4F,&H06,&H00,&HCD,&H4E,&HE5,&HE6,&H80,&H20,&HF9,&HC9
9040 REM ******* DATA FOR INPUT IEEE-488 ROUTINE******
9050 DATA &H3A,&HFB,&HCE,&HFE,&H02,&H28,&H1B,&H0E,&H3F,&HCD,&H4B,&HE5,&HE6,&H30
9060 DATA &H20,&HF9,&H3A,&HFC,&HCE,&HC6,&H40,&H4F,&HCD,&H4B,&HE5,&HE6,&H80
9070 DATA &H20,&HF9,&H3E,&H02,&H32,&HFB,&HCE,&HCD,&H51,&HE5,&H32,&HFE,&HCE,&H70
9080 DATA &HE6,&H80,&H20,&HF5,&H3E,&H01,&H32,&HFD,&HCE,&HC9
```

```
10 CLEAR,43000!
11 PRINT CHR$(26);
15 INPUT "SELECT DEVICE ADDRESS (0-30): ";A1
16 IF A1<0 OR A1>30 THEN 15
17 RESTORE
20 MEM=50000!:LENGTH=102
23 COUT=MEM:CIN=MEM+48
26 MOUT=&HCEFF:MIN=&HCEFE:MSTAT=&HCEFD:ADDR=&HCEFC:STATE=&HCEFB:STAT=&HCEFA
27 POKE STATE,0: POKE ADDR,A1
30 FOR X=0 TO LENGTH-1
40 READ A:POKE MEM+X,A:NEXT X
50 REM ****************************************
60 X$="EKEY":GOSUB 8000: IF PEEK(MIN)<>6 THEN 60
100 PRINT CHR$(27);CHR$(&H29);"<PMI>";CHR$(27);CHR$(&H28);:INPUT " ",Z$
105 IF Z$="" THEN 100
106 IF Z$="HELP" THEN GOSUB 1000:GOTO 100
110 X$=Z$: GOSUB 8000
120 IF PEEK(MIN)<>6 THEN PRINT Z$;"?": GOTO 100
130 IF PEEK(STAT) AND 1 = 1 THEN 100
140 GOSUB 8100: PRINT Z$;" = ";A$: GOTO 100
1000 GOSUB 2000
1010 PRINT "ALT                 ALTERNATING MARK/SPACE PATTERN"
1020 PRINT "BA                  READ BLOCKS ANALYZED"
1030 PRINT "BI                  READ BIAS"
1040 PRINT "BR [R]              SET/READ BIT RATE"
1050 PRINT "BRD                 STEP BIT RATE DOWN"
1060 PRINT "BRU                 STEP BIT RATE UP"
1070 PRINT "BS [S]              SET/READ BLOCK SIZE 10^S"
1080 PRINT "CLR                 CLEAR ERROR AND BLOCK COUNTS"
1090 PRINT "CS [S]              SET/READ CHARACTER SIZE"
1100 PRINT "DCD                 READ STATE OF 'DCD'"
1110 PRINT "DKEY                DISABLE FRONT PANEL KEYS"
1120 PRINT "EKEY                ENABLE FRONT PANEL KEYS"
1130 PRINT "DSR                 READ STATE OF 'DSR'"
1140 PRINT "DTR                 SET/READ STATE OF 'DTR'"
1150 PRINT "ER1                 READ BIT ERRORS"
1160 PRINT "ER2                 READ CHARACTER ERRORS"
1170 PRINT "EV [START STOP]     SET/READ EVENT TIMER"
1180 PRINT "EXT                 SET TO EXTERNAL CLOCK"
1190 PRINT "IL [L]              SET/READ INTERFACE LEVEL"
1200 PRINT "MARK                MARK PATTERN SELECT"
1210 PRINT "MD [M]              SET/READ MODE (ASYNC/SYNC)"
1220 PRINT "PD [D]              SET/READ POLL DELAY"
1230 GOSUB 2100
1240 PRINT "PING                PING PATTERN SELECT"
1250 PRINT "PL [N]              SET POLL PATTERN 1 TO 5"
1260 PRINT "PONG                PONG PATTERN SELECT"
1270 PRINT "PR [P]              SET/READ PARITY"
1280 PRINT "RC                  READ STATE OF 'RC'"
1290 PRINT "RCL [N]             RECALL PROGRAM 0 TO 9"
1300 PRINT "RD                  READ STATE OF 'RD'"
1310 PRINT "RND [N]             SET RANDOM PATTERN 2047,511,63"
1320 PRINT "RTS [N]             SET/READ STATE OF 'RTS'"
1330 PRINT "RUN [R]             SET/READ RUN STATE"
1340 PRINT "SB [N]              SET/READ NUMBER OF STOP BITS"
```

```
1350 PRINT "SCTS                READ STATE OF 'SCTS'"
1360 PRINT "SDCD                READ STATE OF 'SDCD'"
1370 PRINT "SPACE               SPACE PATTERN SELECT"
1380 PRINT "SQ                  READ STATE OF 'SQ'"
1390 PRINT "SRD                 READ STATE OF 'SRD'"
1400 PRINT "ST [N]              SET/READ STATE OF SELFTEST"
1410 PRINT "STO [N]             STORE PROGRAM 0 TO 9"
1420 PRINT "STOP                STOP TEST"
1430 PRINT "SY [S]              SET/READ SYNC (BREAK/RESET)"
1440 PRINT "TC                  READ STATE OF 'TC'"
1450 PRINT "TCX                 READ STATE OF 'TCX'"
1460 GOSUB 2100
1470 PRINT "TD                  READ STATE OF 'TD'"
1480 PRINT "USER [U]            SET/READ USER PATTERN"
1490 PRINT "XE [N]              SET/READ STATE OF ERROR XMIT"
1500 GOSUB 2100: RETURN
2000 PRINT CHR$(26);:RETURN
2100 PRINT:PRINT "PRESS ANY KEY TO CONTINUE";
2110 A$=INKEY$:IF LEN(A$)=0 THEN 2110 ELSE GOTO 2000
8000 X$=X$+CHR$(13)
8010 FOR N=1 TO LEN(X$)
8020 POKE MOUT,ASC(MID$(X$,N,1)):CALL COUT
8030 NEXT N
8040 CALL CIN
8050 RETURN
8100 A$=""
8120 GOSUB 8140
8130 IF ASC(RIGHT$(A$,1))<>6 THEN 8120
8135 A$=LEFT$(A$,LEN(A$)-1):RETURN
8140 CALL CIN
8150 A$=A$+CHR$(PEEK(MIN)):RETURN
9000 REM ******* DATA FOR IEEE-488 OUTPUT ROUTINE *****
9010 DATA &H3A,&HFB,&HCE,&HFE,&H01,&H28,&H1B,&H0E,&H5F,&HCD,&H4B,&HE5
9020 DATA &HE6,&H80,&H20,&HF9,&H3A,&HFC,&HCE,&HC6,&H20,&H4F,&HCD,&H4B,&HE5
9030 DATA &HE6,&H80,&H20,&HF9,&H3E,&H01,&H32,&HFB,&HCE,&H3A,&HFF,&HCE
9032 DATA &H4F,&H06,&H00,&HCD,&H4E,&HE5,&HE6,&H80,&H20,&HF9,&HC9
9040 REM ******* DATA FOR INPUT IEEE-488 ROUTINE******
9050 DATA &H3A,&HFB,&HCE,&HFE,&H02,&H28,&H1B,&H0E,&H3F,&HCD,&H4B,&HE5,&HE6,&H80
9060 DATA &H20,&HF9,&H3A,&HFC,&HCE,&HC6,&H40,&H4F,&HCD,&H4B,&HE5,&HE6,&H80
9070 DATA &H20,&HF9,&H3E,&H02,&H32,&HFB,&HCE,&HCD,&H51,&HE5,&H32,&HFE,&HCE,&H7D
9080 DATA &H32,&HFA,&HCE,&HE6,&H80,&H20,&HF2,&H3E,&H01,&H32,&HFD,&HCE,&HC9
```

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## 10.0 LIMITED WARRANTY

Phoenix Microsystems warrants each model 5000 against defects in material and workmanship for a period of one year from the date the Model 5000 shipped to the customer. If at any time during the warranty period, the test set should malfunction, Phoenix will repair or at Phoenix's option replace the unit free of charge. Owner must return the unit to the factory shipping prepaid and packaged to best commercial standard for electronic equipment shipment. Phoenix will provide one day turnaround and pay shipping charges for delivery on return. Customer is responsible for mode and cost of shipment to Phoenix.

Warranty does not apply if the unit has been damaged by accident, misuse or as a result of service or modification by other than Phoenix personnel.

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